National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas 77058

JSC-17882

SHUTTLE PAYLOAD INTEGRATION & CARGO EVALUATION (SPICE) USER'S GUIDE

Job Order 45-503

Prepared By

Lockheed Engineering and Management Services Company

Houston, Texas

Contract NAS 9-15800

For

EXPERIMENT SYSTEMS DIVISION

December 1981

LEMSCO-17563

TECHNICAL REPORT INDEX/ABSTRACT

(See instructions on reverse side.)

1. TITLE AND SUBTITLE OF DOCUMENT	2. JSC NO.
Shuttle Payload Integration and Cargo Evaluation (SPICE), User's Guide	JSC- 17882

3. CONTRACTOR/ORGANIZATION NAME	4. CONTRACT OR GRANT NO.
Lockheed Engineering & Management Services Company	NAS 9-15800
5. CONTRACTOR/ORIGINATOR DOCUMENT NO.	**6. PUBLICATION DATE (THIS ISSUE)**
LEMSCO-17563	January, 1982
7. SECURITY CLASSIFICATION	**8. OPR (OFFICE OF PRIMARY RESPONSIBILITY)**
Unclassified	Experiment Systems Division
9. LIMITATIONS GOVERNMENT HAS UNLIMITED RIGHTS [X] YES [ ] NO	**10. AUTHOR(S)** Barry E. Endsley
IF NO, STATE LIMITATIONS AND AUTHORITY	
11. DOCUMENT CONTRACT REFERENCES	**12. HARDWARE CONFIGURATION**
WORK BREAKDOWN STRUCTURE NO. Job Order 45-503	SYSTEM N/A
CONTRACT EXHIBIT NO.	SUBSYSTEM N/A
[illegible] NO. AND REVISION	MAJOR EQUIPMENT GROUP
[illegible] LINE ITEM NO.	N/A

13. ABSTRACT

The Shuttle Payload Integration and Cargo Evaluation (SPICE) is a computer program written for the UNIVAC 1110 computer. SPICE is a flight manifesting tool for analyzing the feasibility of proposed Shuttle flights by computing performance and mass properties for the vehicle and its cargo. The User's Guide describes the program and instructs the user in its execution.

14. SUBJECT TERMS

flight manifest

payload integration

mass properties

SHUTTLE PAYLOAD INTEGRATION & CARGO EVALUATION (SPICE) USER'S GUIDE

Job Order 45-503

PREPARED BY

B. E. Endsley

APPROVED BY

LOCKHEED	NASA/JSC
J. E. Vinson, Supervisor Data Processing & Analysis Section	R. C. Dyer/EDS
B. O. Lippert, Manager Experiments Systems Department	J. H. Langford, Chief Systems Engineering Branch

Prepared for

Experiment Systems Division

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1. PURPOSE AND SCOPE

The Shuttle Payload Integration and Cargo Evaluation System (SPICE) is an interactive FORTRAN computer program, written for the EXEC 8 operating system on the Univac 1110 computer. SPICE is a flight manifesting tool for analyzing the feasibility of proposed Shuttle flights. It produces a 'level A' performance analysis, and calculates vehicle and cargo mass properties. Output from SPICE is used in production of the STS Flight Assignment Baseline (JSC-13000-X).

2. SYSTEM OVERVIEW

A central aspect of SPICE is the STS Master Data Base. The STS Master Data Base is the central repository of data required in the manifesting process. SPICE has a set of data access routines for performing data base management tasks. See figure 1-1 for a detailed format of the STS Master Data Base.

SPICE is a modular, menu-driven program. It contains six independent processors which perform specific functions. Each processor references the data base via the data access routines, and elicits additional input from the user through the alphanumeric keyboard. The user is prompted for input so that he knows what is expected of him. However, it is recommended that inexperienced users refer to this document before proceeding.

2.1 HARDWARE CONFIGURATION

SPICE was written for a Univac 1110 Computer with an EXEC 8 operating system. It is operated in an interactive mode for remote terminals. It was designed principally for a Tektronix 4014 or 4015 CRT, which is reflected in the display page size and the graphical output. However, the non-graphical sections of the program can be operated from any teletype-compatible terminal.

2.2 SOFTWARE CONFIGURATION

The program is written in the FORTRAN V language. The EXEC 8 NTRAN I/O Processor is used for random-access file manipulation and graphics is provided via ISSCO's DISSPLA plotting package.

****

STS MASTER DATA BASE

****

HEADER BLOCK (2 SECTORS)

20 WORDS	A	120 CHARACTERS OF HEADER INFORMATION
2 WORDS	A	MANIFEST IDENTIFICATION
2 WORDS	A	BASELINE REFERENCE BOOK NUMBER
1 WORD	I	NEXT AVAILABLE SECTOR ADDRESS
1 WORD	A	FILE STATUS FLAG (DATE OF LAST UPDATE)
1 WORD	I	MAXIMUM NUMBER OF TRACKS ASSIGNED TO FILE
1 WORD		SPARE
1 WORD	I	NUMBER OF FLIGHTS ON DATA BASE
1 WORD	I	FLIGHT INDEX SECTOR ADDRESS
1 WORD	I	NUMBER OF DATA ITEMS
1 WORD	I	DATA INDEX SECTOR ADDRESS
1 WORD	I	NUMBER OF PAYLOADS
1 WORD	I	PAYLOAD INDEX SECTOR ADDRESS
1 WORD	I	NUMBER OF CARRIERS
1 WORD	I	CARRIER INDEX SECTOR ADDRESS
1 WORD	A	BASELINE ID
1 WORD	I	BASELINE DEFINITION SECTOR ADDRESS
18 WORDS		SPARE WORDS FOR ADDITIONAL BASELINE DEFINITIONS

FLIGHT INDEX (5 SECTORS)

1 WORD	A	FLIGHT NUMBER OF 1ST FLIGHT
1 WORD	I	FLIGHT DEFINITION BLOCK SECTOR ADDRESS
136 WORDS		FLIGHT NUMBERS AND SECTOR ADDRESSES FOR 68 ADDITIONAL FLIGHTS
1 WORD		UNUSED
1 WORD	I	SECTOR ADDRESS OF NEXT FLIGHT INDEX, IF REQUIRED

FLIGHT DEFINITION BLOCK (3 SECTORS)

1 WORD	A	BASELINE ID
1 WORD	A	PREVIOUS FLIGHT NUMBER
1 WORD	A	VEHICLE TYPE
1 WORD	A	DATE OF LAUNCH - MMDDYY
1 WORD	A	LAUNCH SITE
1 WORD	A	THROTTLE SETTINGS
1 WORD	O	BITS 0- 5 CREW SIZE 6-11 MISSION LENGTH 12-17 NOT USED 18-23 FLAG = 0, IF ET BLOCK I INT. 1, IF ET BLOCK I 2, IF ET BLOCK II 24-29 FLAG = 1, IF LIGHT WEIGHT SRB USED 30-35 FLAG = 1, IF UTR HOT SOLIDS USED

55:)

FIGURE 1-1 STS MASTER DATA BASE FORMAT

```
  2 WORDS        SPARE
  1 WORD     I   SECTOR ADDRESS OF PAYLOAD ATTACHMENT DATA BLOCK
  1 WORD     R   MAX. Q
  1 WORD     R   INCLINATION OF ORBIT
  1 WORD     R   ALTITUDE
  1 WORD     R   INTEGRAL OMS PROPELLANT WEIGHT
  1 WORD     R   OMS KITS PROPELLANT WEIGHT
  1 WORD     R   EI DELTA RCS FORWARD
  1 WORD     R   EI DELTA RCS AFT
  1 WORD     R   EI DELTA OMS
  1 WORD     R   EI DELTA NPC
  1 WORD     R   RTLS DELTA RCS FORWARD
  1 WORD     R   RTLS DELTA RCS AFT
  1 WORD     R   RTLS DELTA OMS
  1 WORD     R   RTLS DELTA NPC
  1 WORD     R   AOA DELTA RCS FORWARD
  1 WORD     R   AOA DELTA RCS AFT
  1 WORD     R   AOA DELTA OMS
  1 WORD     R   AOA DELTA NPC
  1 WORD     R   FLIGHT PERFORMANCE MARGIN
  1 WORD     R   CAPABILITY
  4 WORDS    R   VEHICLE U/O CARGO -- WEIGHT AND C.G.
  3 WORDS    R   PAYLOAD CHARGE UP -- WEIGHT, X0, Y0
  3 WORDS    R   PAYLOAD CHARGE DOWN -- WEIGHT, X0, Y0
  8 WORDS        SPARE
  1 WORD     I   NUMBER OF PAYLOADS
  2 WORDS    A   1ST PAYLOAD ID
  2 WORDS    A   2ND PAYLOAD ID
  2 WORDS    A   3RD PAYLOAD ID
  2 WORDS    A   4TH PAYLOAD ID
  2 WORDS    A   5TH PAYLOAD ID
  2 WORDS    A   6TH PAYLOAD ID
  2 WORDS    O   ITEM INDICATORS FOR CATEGORY 1
 22 WORDS    O   ITEM INDICATORS FOR UP TO 11 MORE CATEGORIES
     NOTE: ITEM INDICATORS ARE KEYED TO CATEGORIES AND ITEMS
           DEFINED IN A BASELINE DEFINITION BLOCK. A '1' IN A BIT
           INDICATES THE ITEM IS PRESENT ON THE FLIGHT. LIMITS OF
           72 ITEMS AND 12 CATEGORIES.

        PAYLOAD ATTACHMENT DATA BLOCK     (4 SECTORS)

  1 WORD     O   BRIDGES INDICATOR. BITS 1 - 28 INDICATE BRIDGES
                 USED. 15-28 ARE MIRROR IMAGES OF 1 - 14.
  1 WORD     O   KEELS INDICATOR.  BITS 1 - 12 INDICATE KEELS USED.
  1 WORD     I   NUMBER OF LONGERON FITTINGS REQUIRED.
  1 WORD     I   1ST LONGERON FITTING ID NUMBER
  1 WORD     R   1ST LONGERON FITTING WEIGHT
  3 WORDS    R   1ST LONGERON FITTING CENTER-OF-GRAVITY
100 WORDS        SPACE FOR 20 ADDITIONAL LONGERONS
  4 WORDS        SPARE


        DATA DICTIONARY     (10 SECTORS)
110:)
```

FIGURE 1-1 CONTINUED

```
  4 WORDS  A   DATA ITEM NAME
  1 WORD   R   ITEM WEIGHT
  3 WORDS  R   COORDINATES OF CENTER-OF-GRAVITY
272 WORDS      SPACE FOR 34 MORE DATA ITEMS


          DATA INDEX     (5 SECTORS)

  4 WORDS  A  1ST ENTRY IN 1ST DATA DICTIONARY BLOCK
  1 WORD   I  SECTOR ADDRESS OF 1ST DATA DICTIONARY BLOCK
  4 WORDS  A  1ST ENTRY IN 2ND DATA DICTIONARY BLOCK
  1 WORD   I  SECTOR ADDRESS OF 2ND DATA DICTIONARY BLOCK
130 WORDS     SPACE FOR 26 ADDITIONAL DATA DICTIONARY BLOCKS


          BASELINE DEFINITION BLOCK     (NWDS WORDS)

  1    WORD   I  NUMBER OR CATEGORIES   (NCAT)
NCAT   WORDS  I  NUMBER OF DATA ITEMS IN EACH CATEGORY  (ND1 - NDN)
4*NCAT WORDS  A  24-CHARACTER NAME OF EACH CATEGORY
4*ND1  WORDS  A  DATA ITEM NAMES FOR CATEGORY 1
4*ND2  WORDS  A  DATA ITEM NAMES FOR CATEGORY 2
   .     .    .    .    .
   .     .    .    .    .
   .     .    .    .    .
4*NDN  WORDS  A  DATA ITEM NAMES FOR CATEGORY NCAT

   *** NOTE:  NWDS = 4*(ND1 + ND2 + ... + NDN) + 5*NCAT + 1


          PAYLOAD INDEX     (5 SECTORS)

  2 WORDS  A  PAYLOAD ID
  1 WORD   I  PAYLOAD DATA BLOCK SECTOR ADDRESS
135 WORDS     SPACE FOR 45 ADDITIONAL PAYLOADS
  1 WORD      UNUSED
  1 WORD   I  SECTOR ADDRESS OF NEXT PAYLOAD INDEX


          CARRIER INDEX     (5 SECTORS)

  1 WORD   A  CARRIER ID
  1 WORD   I  CARRIER DATA BLOCK SECTOR ADDRESS
136 WORDS     SPACE FOR 68 ADDITIONAL CARRIERS
  1 WORD      UNUSED
  1 WORD   I  SECTOR ADDRESS OF NEXT CARRIER INDEX


          PAYLOAD DATA BLOCK     (2 SECTORS)

  6 WORDS  A   PAYLOAD NAME
  1 WORD   A   PAYLOAD MISSION TYPE   (PMT)
  3 WORDS  A   DISCIPLINE CODE   (SSDPLN)
  3 WORDS  A   USER NAMES   (SSUSR6)
165:)
```

FIGURE 1-1 CONTINUED

```
   2 WORDS  A   SUBSET OF FLIGHT ELEMENT   (SSFLTE)
   1 WORD   A   PAYLOAD CODE
   1 WORD   A   CARRIER ID
   3 WORDS  O   18 YEAR FLIGHT FREQUENCIES.  6 BITS PER YEAR.
   1 WORD   I   REPEAT FLAG
   1 WORD   I   SECTOR ADDRESS OF PREDEFINED PAYLOAD ATTACHMENT
                DATA BLOCK.
   1 WORD   R   PAYLOAD WEIGHT UP
   1 WORD   R   PAYLOAD WEIGHT DOWN
   1 WORD   R   PAYLOAD LENGTH UP
   1 WORD   R   PAYLOAD LENGTH DOWN
   3 WORDS  R   DEPLOYMENT ORBIT - HEIGHT AT APOGEE, HEIGHT AT PERIGEE,
                ANGLE OF INCLINATION.     (PARKING ORBIT)
   3 WORDS  R   TRANSFER ORBIT
   3 WORDS  R   FINAL ORBIT
   1 WORD   R   DURATION   (PDUR)
   3 WORDS  R   CENTER-OF-GRAVITY UP
   3 WORDS  R   CENTER-OF-GRAVITY DOWN
   1 WORD   R   PAYLOAD DIAMETER
   1 WORD   R   POWER REQUIREMENTS
   1 WORD   R   REQUIRED CLEARANCE IN FRONT OF PAYLOAD
  11 WORDS      SPARE

          CARRIER DATA BLOCK     (2 SECTORS)

   1 WORD   R   CARRIER WEIGHT UP
   1 WORD   R   CARRIER WEIGHT DOWN
   1 WORD   R   CARRIER LENGTH
   1 WORD   R   CARRIER DIAMETER
   3 WORDS  R   CARRIER CENTER-OF-GRAVITY
   2 WORDS  A   ASE IDENTIFIER
   1 WORD   R   ASE WEIGHT UP
   1 WORD   R   ASE WEIGHT DOWN
   1 WORD   R   ASE LENGTH
   1 WORD   R   ASE DIAMETER
   3 WORDS  R   ASE CENTER-OF-GRAVITY
   2 WORDS  A   EXTRA WEIGHT IDENTIFIER (SHROUD, SHIELD, ETC.)
   1 WORD   R   EXTRA WEIGHT UP
   1 WORD   R   EXTRA WEIGHT DOWN
   1 WORD   R   EXTRA LENGTH
   1 WORD   R   EXTRA DIAMETER
   3 WORDS  R   EXTRA CENTER-OF-GRAVITY
   1 WORD   R   CARRIER POWER REQUIREMENTS
   1 WORD   R   CARRIER DELIVERY CAPACITY
   1 WORD   R   DELTA V FOR EVASIVE MANEUVERS
   1 WORD   R   DELTA V FOR RETURN TO ORBIT
   1 WORD   R   DISTANCE FROM KEEL TO FRONT TRUNNION
   1 WORD   R   DISTANCE FROM KEEL TO AFT EDGE
   1 WORD   I   PAYLOAD POSITION FLAG. <0 FORWARD MOUNTED
                                       =0 TOP MOUNTED
                                       >0 REAR MOUNTED
   1 WORD   I   PRIMARY LONGERON INDICATOR
   1 WORD   I   NUMBER OF LONGERON FITTINGS   (NL) (MAX. = 22)
NL-1 WORDS R   DISTANCE BETWEEN LONGERON FITTINGS
220:)
```

FIGURE 1-1 CONTINUED

```
  1 WORD   I   =1 IF DEPLOYABLE FITTINGS REQUIRED


****** NOTES *****
  1. ALL DATA BLOCKS BEGIN AT THE FIRST WORD OF A SECTOR.
  2. HEADER BLOCK RESIDES IN SECTORS 0 AND 1. ALL OTHERS
     ARE VARIABLE.
  3. ENTRIES IN THE FLIGHT INDEX, DATA DICTIONARY, PAYLOAD
     INDEX AND CARRIER INDEX ARE MAINTAINED IN ALPHABETIC ORDER.
  4. BITS ARE NUMBERED 0 - 35, BEGINNING WITH THE MOST SIGNIFICANT BIT.
EOF:231 SCAN:10
0:>
```


FIGURE 1-1 CONTINUED

3. USER PROCEDURE

3.1 OVERVIEW

This section of the documentation will describe the purpose of each processor and instruct the potential user in its features, pitfalls, and idiosyncracies. There are several procedures common to all processors which will be explained first.

3.1.1 MENUS

A menu consists of a numbered list of items, where the user is expected to select an item. An item is selected by inputting the corresponding number. The items can be parameters to be used in some process, or an option list of possible actions which can be taken.

In the case of an option list, the menu becomes a control point. At the completion of a selected option, the program will normally return to the menu for another selection. In these cases, the zero item (which can be selected by inputting a zero or a C/R) will continue execution beyond the province of the menu or return to a higher level menu.

3.1.2 QUESTIONS

A common method of communication between SPICE and the user is the question. For example SPICE might print, 'DO YOU WISH TO ADD BALLAST TO CORRECT YO? (Y OR N).' The user must answer the question by entering a Y for yes or N for no. The only other answers that will be accepted are CTRL-A and CTRL-B (see next section).

3.1.3 CTRL-A and CTRL-B

In the process of execution, it may become necessary to back-up, or prematurely abort a processor. This could happen for example, if the user selected the wrong flight to be displayed and did not want to go through the entire flight. Backing up is accomplished by depressing the CTRL key and either A or B, simultaneously, followed by a C/R. CTRL-A or CTRL-B can be input any time user input is requested.

CTRL-B backs up to an immediately preceding question or menu. CTRL-B will not work if any actions taken since the last question are irreversible. CTRL-A backs up to the next higher level menu.

3.1.4 EXECUTION MODE

Upon entering a processor, the user is asked to select an execution mode. There are three or four choices, depending on the processor. The execution mode affects the amount of output produced by SPICE.

3.1.4.1 Normal Mode

The normal mode of execution is selected by entering an 'N'. Users should select the normal mode most of the time, particularly if unfamiliar with the program.

3.1.4.2 Fast Mode

By entering 'F' for fast mode, the user will often accelerate execution of the processor. However, much of the output produced in the normal mode will not be available.

3.1.4.3 Debug Mode

Debug mode is designed to be executed by the programmer. It generates intermediate output for debugging purposes.

3.1.4.4 Batch Mode

Batch mode is available in some processors. It diverts output from the screen to an external file. Upon completion of execution, the file can be stored in a data element or output to a line printer.

3.2 SPICE EXECUTIVE

SPICE can be executed from any Univac EXEC 8 compatible terminal. Once the user has entered his @RUN card, the following sequence will activate SPICE:

```
@USE S,PL-L70721*SPICE
@ASG,A S.
@XQT S.SPICE
```

SPICE begins execution with the message:

WELCOME TO THE SPICE SYSTEM. ENTER DATA BASE NAME OR C/R TO USE
AAAAAAAAAAAAAAA (3-2)

The user should input the Univac 1110 filename that contains the data base he wishes to use. By entering a C/R, he signifies that he wishes to use the write-protected public access data base. Inputting a C/R will result in

DATA BASE IS WRITE-PROTECTED. INPUT PASSWORD IF YOU WISH TO HAVE
UPDATE CAPABILITY. C/R TO CONTINUE IN READ-ONLY MODE. (3-3)

If the user has the authority to update the write-protected data base, he will have been supplied with the password which he can enter. Continuing in read-only mode means that data can be read from the data base and displayed, but no data base updates will be allowed.

After the data base has been selected, two things can happen. If the input file does not exist or is not available, SPICE will terminate with an error message. If the file is successfully assigned, header information will be read and displayed:

THIS DATA BASE WAS LAST UPDATED ON NN/NN/NN
MANIFEST ID = AAAAAAAAAAAA
BASELINE REFERENCE NO. = AAAAAAAAAAAA
DO YOU WISH TO INPUT MANIFEST ID AND REFERENCE BOOK NUMBER? (3-4)

The user may enter Y and then input two 12-character alphanumeric strings. An N answer leads to the SPICE processor menu.

SPICE PROCESSORS
0. TERMINATE EXECUTION OF SPICE
1. DATA BASE MANAGEMENT
2. SAMPLE PAYLOAD DATA
3. CARGO PLANNING DATA
4. C. G. PROCESSOR
5. REPORT GENERATOR
6. GRAPHICS PROCESSOR
ENTER NUMBER OF MENU SELECTION (0-6)

3.3 DATA BASE MANAGEMENT PROCESSOR

The Data Base Management Processor is used for displaying, editing, querying and adding data to the STS Master Data Base. There are five principal types of data blocks -- Flight Definition Block, Data Dictionary, Baseline Definition Block, Payload Data Block, and Carrier Data Block. There is a separate sub-processor for referencing each of these types of data blocks.

The user is first asked to select the execution mode -- normal, fast or debug. Then the data types menu is displayed.

```
DATA TYPES
0.  RETURN TO SPICE EXECUTIVE
1.  BASELINE DEFINITION
2.  CARRIER DATA
3.  DATA DICTIONARY
4.  FLIGHT DEFINITION
5.  PAYLOAD DATA
ENTER NUMBER OF DESIRED DATA TYPE (0-5)                    (3-6)
```

Upon the selection of a data type, the appropriate subprocessor is called.

3.3.1 BASELINE DEFINITION SUBPROCESSOR

A baseline definition is a list of data items divided into categories. The data items represent weights and C.G.'S that may or may not be carried on a specific flight. Figure 3-1 is a typical baseline definition. The subprocessor begins by displaying a list of options.

```
BASELINE DATA MANAGEMENT OPTIONS
0.  RETURN TO DATA TYPES MENU
1.  ADD A BASELINE DEFINITION TO THE DATA BASE
2.  DELETE A BASELINE DEFINITION
3.  DISPLAY/MODIFY A BASELINE DEFINITION
4.  LIST ALL BASELINES CURRENTLY IN DATA BASE
5.  LIST ALL DATA ITEM NAMES IN DATA DICTIONARY
ENTER BASELINE DATA MANAGEMENT OPTION NUMBER (0-5)         (3-7)
```

```
THERE ARE  7 CATEGORIES OF DATA FOR THE BAS099 BASELINE.
THE CATEGORY NAMES WILL BE DISPLAYED SEQUENTIALLY. FOR EACH ONE, ENTER
 CONTINUE, DELETE, OR DISPLAY.
  *CONTINUE* WILL RESULT IN NEXT CATEGORY NAME BEING DISPLAYED.
  *DELETE*   WILL DELETE THE ENTIRE CATEGORY.
  *TABULATE* WILL DISPLAY THE DATA ITEM NAMES FOR THE CATEGORY.

CATEGORY NAME = VEHICLE INERT              (CONTINUE, DELETE OR TABULATE)
>T

VEHICLE INERT              CATEGORY
NO.    ITEM NAME                    NO.    ITEM NAME
 1     OV-099 INERT (DERIVED)        2     BRIDGE&KEEL ALLO.
 3     RMS                           4     RMS INST & JET CNTL
 5     GALLEY                        6     GALLEY C/O
 7     FLT DECK SEAT (MS)            8     FLT DECK SEAT (PS)
 9     EPS 3 PLUMBING               10     EPS 3 TANK
ENTER E TO EDIT DATA OR C/R TO CONTINUE.
WARNING. ANY EDITING MAY INVALIDATE FLIGHTS REFERENCING THIS BASELINE.
>

CATEGORY NAME = MAIN ENGINE                (CONTINUE, DELETE OR TABULATE)
>T

MAIN ENGINE                CATEGORY
NO.    ITEM NAME                    NO.    ITEM NAME
 1     SSMEX3 OV-099
ENTER E TO EDIT DATA OR C/R TO CONTINUE.
WARNING. ANY EDITING MAY INVALIDATE FLIGHTS REFERENCING THIS BASELINE.
>

CATEGORY NAME = FLIGHT KITS                (CONTINUE, DELETE OR TABULATE)
>T

FLIGHT KITS                CATEGORY
NO.    ITEM NAME                    NO.    ITEM NAME
 1     EPS 4 PLUMBING                2     EPS 4 TANK
 3     ATCS PANEL                    4     MADS 099
 5     P/L RECORDER                  6     SMCH CABLE
 7     S/L INTERFACE CABLE           8     A/L INSIDE MOD
 9     ARS DUCT                     10     1387 CABLE
11     TUNNEL ADAPTOR               12     RMS 2 U/SUPPORTS
13     AFD HARNESS                  14     STD SWITCH P1
15     STD SWITCH P2                16     AUX O2 HDWR
17     RTG COOLING                  18     FLUID SYS MSN KIT
19     P/L TIMING BUFFER            20     CCTV
21     DATA ACQ CAMERA              22     FAMOS DELTA
23     MMU                          24     GAS CONTROLLER
25     AFD EQUIPMENT (SLD1)
ENTER E TO EDIT DATA OR C/R TO CONTINUE.
WARNING. ANY EDITING MAY INVALIDATE FLIGHTS REFERENCING THIS BASELINE.
>
```

FIGURE 3-1 BASELINE DEFINITION DATA

```
CATEGORY NAME = PERSONNEL                    (CONTINUE, DELETE OR TABULATE)
>

PERSONNEL                  CATEGORY
NO.    ITEM NAME                    NO.    ITEM NAME
 1     CREW & EQUIPMENT              2     SLEEP STATION
 3     SLEEPING BAGS(3)              4     SLEEPING BAGS(4)
 5     DELTA FOR GALLEY C/O          6     TABLE & DESK
 7     CBSA                          8     MID DECK SEAT 1
 9     MID DECK SEAT 2              10     EMU (1 UNIT)
11     EMU  (2)                     12     CBSA DELTA BR1
ENTER E TO EDIT DATA OR C/R TO CONTINUE.
WARNING. ANY EDITING MAY INVALIDATE FLIGHTS REFERENCING THIS BASELINE.
>

CATEGORY NAME = NON PROPULSIVE CONS          (CONTINUE, DELETE OR TABULATE)
>T

NON PROPULSIVE CONS        CATEGORY
NO.    ITEM NAME                    NO.    ITEM NAME
 1     2 EPS TANKS                   2     2 EPS TANKS (OFFLOADED)
 3     DELTA FOR 3RD TANK            4     DELTA FOR 4TH TANK
 5     RESIDUALS TK 3                6     RESIDUALS TK 4
 7     AUX O2
ENTER E TO EDIT DATA OR C/R TO CONTINUE.
WARNING. ANY EDITING MAY INVALIDATE FLIGHTS REFERENCING THIS BASELINE.
>

CATEGORY NAME = PROPULSIVE CONSUM            (CONTINUE, DELETE OR TABULATE)
>T

PROPULSIVE CONSUM          CATEGORY
NO.    ITEM NAME                    NO.    ITEM NAME
 1     MPS FPR NOM 3 SIG             2     RCS PROPELLANT AFT
 3     RCS PROPELLANT FWD
ENTER E TO EDIT DATA OR C/R TO CONTINUE.
WARNING. ANY EDITING MAY INVALIDATE FLIGHTS REFERENCING THIS BASELINE.
>

CATEGORY NAME = DISCRETIONARY PAYLOADS       (CONTINUE, DELETE OR TABULATE)
>T

DISCRETIONARY PAYLOADS     CATEGORY
NO.    ITEM NAME                    NO.    ITEM NAME
 1     ACIP                          2     ACIP RECORDER
 3     CFES                          4     MLR
ENTER E TO EDIT DATA OR C/R TO CONTINUE.
WARNING. ANY EDITING MAY INVALIDATE FLIGHTS REFERENCING THIS BASELINE.
>
```

FIGURE 3-1 CONTIN ED

3.3.1.1 Add a Baseline Definition to the Data Base

To add a new baseline definition to the data base, assign it an identifier. The baseline identifier is a six character alphanumeric name. Next, input the number of categories the baseline will contain. SPICE will ask

DO YOU WANT TO HAVE EACH DATA ITEM VERIFIED AS BEING ON THE DATA BASE? (3-8)

If a yes answer is given, the Data Dictionary will be searched after each data item name is entered. Data items not in the Data Dictionary will not be accepted.

For each category, a category name and the number of data items to be in the category must be specified. Each data item name is also entered. The category names and the data item names are each twenty-four character alphanumerics.

3.3.1.2 Delete a Baseline Definition

To delete a baseline, simply input the appropriate identifier.

3.3.1.3 Display/Modify a Baseline Definition

The appropriate identifier is entered and spice displays

THE CATEGORY NAMES WILL BE DISPLAYED SEQUENTIALLY. FOR EACH ONE,
ENTER CONTINUE, DELETE, OR DISPLAY.
CONTINUE WILL RESULT IN NEXT CATEGORY NAME BEING DISPLAYED.
DELETE WILL DELETE THE ENTIRE CATEGORY.
TABULATE WILL DISPLAY THE DATA ITEM NAMES FOR THE CATEGORY. (3-9)

Category names will be displayed sequentially, and a response requested. If a 'C' is input, the next category name is displayed. If a 'D' is input, the category is deleted. If a 'T' is entered, the data item names for the category are displayed, with the message

ENTER E TO EDIT DATA OR C/R TO CONTINUE.
ANY EDITING MAY INVALIDATE FLIGHTS REFERENCING THIS BASELINE. (3-10)

If a C/R is input, SPICE cycles to the next category. To edit, item numbers to be deleted are entered. They may be entered one per line, or all on one line. For instance, to delete items 1, 3, 5, and 7, one can enter

>1,3,7,5 or >5,1,7,3

Similarly, item numbers to be replaced will be entered. Data item names to be added to the category are next entered. Once all existing categories have been processed, entirely new categories can be added to the baseline.

Editing of baselines should not be undertaken lightly when flights have been defined using that baseline. Flights are defined by selecting specific data items from the baseline. Thus, if item one of category one is deleted, items two through N are moved up a slot. Any flights defined to use item one will now pick up the wrong item.

3.3.1.4 List all Baselines Currently in Data Base

Selection of this option results in a listing of the identifiers for the baselines defined on the data base.

3.3.1.5 List all Data Item Names in Data Dictionary

See section 3.3.3.5

3.3.2 CARRIER DATA MANAGEMENT SUBPROCESSOR

Each payload references a Carrier Data Block. The Carrier Data Block contains weights and centers-of-gravity for upper stage motors, cradles, thermal shrouds and shields. It also contains the geometry required for locating the payload in the cargo bay. Figure 3-2 is a typical Carrier Data Block. The menu display for this subprocessor is:

CARRIER DATA MANAGEMENT OPTIONS
0. RETURN TO DATA TYPES MENU
1. ADD A CARRIER DATA BLOCK TO THE DATA BASE

```
                    C A R R I E R   D A T A   B L O C K

  1  CARRIER ID                                    TEL-D
  2  CARRIER WEIGHT UP                                0.00
  3  CARRIER WEIGHT DOWN                              0.00
  4  CARRIER LENGTH                                   0.00
  5  CARRIER DIAMETER                                 0.00
  6  CARRIER CENTER-OF-GRAVITY          X =           0.00
  7                                     Y =           0.00
  8                                     Z =           0.00
  9  ASE IDENTIFIER                               ASE
 10  ASE WEIGHT UP                                2394.00
 11  ASE WEIGHT DOWN                              2394.00
 12  ASE LENGTH                                     93.00
 13  ASE DIAMETER                                  180.00
 14  ASE CENTER-OF-GRAVITY              X =         34.60
 15                                     Y =         11.50
 16                                     Z =        368.80
 17  EXTRA WEIGHT ID (SHROUD, ETC)
 18  EXTRA WEIGHT UP                                  0.00
 19  EXTRA WEIGHT DOWN                                0.00
 20  EXTRA LENGTH                                     0.00
 21  EXTRA DIAMETER                                   0.00
 22  EXTRA CENTER-OF-GRAVITY            X =           0.00
 23                                     Y =           0.00
 24                                     Z =           0.00
 25  CARRIER POWER REQUIREMENTS                       0.00
 26  CARRIER DELIVERY CAPACITY                        0.00
 27  DELTA V FOR EVASIVE MANEUVERS                   25.00
 28  DELTA V FOR RETURN TO ORBIT                     25.00
 29  DISTANCE FROM KEEL TO FRONT TRUNNION             3.93
 30  DISTANCE FROM KEEL TO AFT EDGE                  81.92
 31  PAYLOAD POSITION FLAG                        0
 32  PRIMARY LONGERON INDICATOR                   1
 33  NUMBER OF LONGERON FITTINGS                  2
 34  DEPLOYABLE FITTINGS FLAG                     0

                  DISTANCES BETWEEN LONGERON FITTINGS
   (35)      (36)      (36)      (36)      (36)      (36)      (36)

  78.70

ENTER ITEM NUMBER TO BE EDITED OR C/R TO CONTINUE
FOR EXAMPLE: TO MODIFY VALUE OF ASE LENGTH, TYPE IN THE NUMERAL 12
>
```

FIGURE 3-2 CARRIER DATA BLOCK

2. DELETE A CARRIER DATA BLOCK
3. DISPLAY/MODIFY A CARRIER DATA BLOCK
4. LIST CARRIER IDENTIFIERS
ENTER CARRIER DATA MANAGEMENT OPTION NO. (0-4) (3-12)

3.3.2.1 Add a Carrier Data Block to the Data Base

A six character alphanumeric identifier is assigned to each carrier. SPICE then prompts the user to input each item in the Carrier Data Block. For instance, item one is

ENTER CARRIER WEIGHT UP > (3-13)

Note that weights are input in units of pounds, distances in units of inches. Centers-of-gravity are normally input in a coordinate system relative to the keel. However, for payloads with a single, fixed location in the cargo bay, the Shuttle coordinate system is expected.

The 'PAYLOAD POSITION FLAG' is one input item. It concerns how the payload is attached to the carrier. If the payload is attached forward of the carrier, input -1. If the payload is attached on top of the carrier, input zero. For aft attachment, input +1.

The 'NUMBER OF LONGERON FITTINGS' actually refers to the number of longeron attach points to be used along the x-axis. Thus, pairs of longerons having the same x-coordinate count as one, and a 'PORT-SIDE ONLY' fitting would also count as one.

After the entire Carrier Data Block is input, it will be displayed and the data can be edited. See section 3.3.2.3.

3.3.2.2 Delete a Carrier Data Block

Carriers are deleted from the data base by entering the carrier identifier. This will continue as long as identifiers are input. A C/R will return the program to the menu (3-12).

3.3.2.3 Display/Modify a Carrier Data Block

For a given identifier, the associated Carrier Data Block is retrieved from the data base and displayed as in figure 3-2. At this point a C/R will return the program to the menu (3-12).

To edit the carrier data, the item number to be edited is input, and the program prompts the user for a new value. When editing is complete, the screen is erased and the edited data block is redisplayed.

3.3.2.4 List Carrier Identifiers

This option displays a list of all of the carriers currently in the data base.

3.3.3 DATA DICTIONARY SUBPROCESSOR

The Data Dictionary contains all items associated with a weight and/or center-of-gravity, with the exception of payloads and carriers. It includes entire vehicles, vehicle parts, fluids, and personnel items. Data items are stored alphabetically. Figure 3-3 is an example of one page of the Data Dictionary.

The list of options for this subprocessor is

```
DATA DICTIONARY DATA MANAGEMENT OPTIONS
0.  RETURN TO DATA TYPES MENU
1.  ADD A DATA ITEM TO THE DATA DICTIONARY
2.  DELETE A DATA ITEM
3.  DISPLAY/MODIFY A DATA ITEM
4.  DISPLAY/MODIFY ALL DATA ITEMS
5.  LIST ALL DATA ITEMS
ENTER DATA DICTIONARY DATA MANAGEMENT OPTION (0-5)
```

(3-14)

3.3.3.1 Add a Data Item to the Data Dictionary

A twenty-four character data item name is assigned by the user. SPICE then requests a weight and center-of-gravity for the item, which are input one value per line.

NO	ITEM NAME	WEIGHT	CENTER-OF-GRAVITY X	Y	Z
1	BALLAST PROVISIONS	22.0	1307.00	0.00	410.00
2	BAY TV CAMERA	75.0	714.30	-8.20	434.10
3	BRIDGE&KEEL ALLO.	675.0	1074.00	26.00	395.00
4	CBSA	385.0	600.00	80.90	393.80
5	CBSA DELTA BR1	173.0	509.60	257.70	563.40
6	CBSA/BEAM 1	385.0	600.00	80.90	393.80
7	CBSA/BEAM 2	558.0	654.50	80.90	393.80
8	CBSA/BEAM 5	568.0	825.00	80.90	393.80
9	CCTV	72.0	968.10	-14.20	437.90
10	CFES	642.0	452.90	-61.10	367.00
11	COMM B ANT	290.0	590.00	-90.00	480.00
12	COMSEC	41.0	550.00	-30.00	410.00
13	CONSOLE INSTALLATION	69.0	560.00	49.90	440.00
14	CREW & EQUIPMENT	3061.0	505.70	3.20	380.50
15	DATA ACQ CAMERA	160.0	955.50	-59.50	436.20
16	DELTA FOR GALLEY C/O	60.0	469.00	-67.00	367.00
17	DELTA FOR OFT	769.0	976.18	-7.40	360.90
18	DELTA FOR TANK 2	-647.0	733.50	77.30	307.90
19	DELTA FOR 3RD TANK	873.0	1104.30	44.10	297.60
20	DELTA FOR 4TH TANK	873.0	1046.80	-61.30	299.20
21	DELTA TO XXM/YYD	0.0	512.30	5.70	368.80
22	DFI COMSOLE	2000.0	450.00	0.00	340.00
23	DFI CONSOLE	2000.0	450.00	0.00	340.00
24	EI DELTA MPS	-5551.0	1408.30	12.90	355.20
25	EI DELTA NPC (1 TKS)	-1965.0	1000.00	-9.80	354.90
26	EI DELTA NPC (2 TKS)	-1965.0	1000.00	-9.80	354.90
27	EI DELTA NPC (3 TKS)	-2976.0	994.00	-8.30	327.70
28	EI DELTA NPC (4 TKS)	-3535.0	994.00	-8.30	327.70
29	EI DELTA NPC (5 TKS)	-3535.0	994.00	-8.30	327.70
30	EI DELTA RCS AFT	-3450.0	1340.60	0.00	469.30
31	EI DELTA RCS AFT (OFLD)	-2800.0	1340.60	0.00	469.30
32	EI DELTA RCS FWD	-1950.0	316.70	5.50	364.70
33	EI DELTA RCS FWD (OFLD)	-630.0	316.70	5.50	364.70
34	EI DOWN WEIGHT LIMIT	32000.0	0.00	0.00	0.00
35	EJECTION SEAT DELTA	331.0	507.00	-3.90	380.40
36	EJECTION SEATS(2)	1421.0	501.00	0.00	437.00
37	EMU (1 UNIT)	401.0	538.00	0.00	366.00
38	EMU 2	803.0	538.00	0.00	366.00
39	EPS 3 PLUMBING	271.0	919.30	-20.40	303.90
40	EPS 3 TANK	594.0	1048.40	-14.80	299.40

ENTER ITEM NUMBER TO EDIT OR C/R TO CONTINUE
>

FIGURE 3-3 DATA DICTIONARY SAMPLE PAGE

3.3.3.2 Delete a Data Item

The name of each data item to be deleted is input.

3.3.3.3 Display/Modify a Data Item

The name of the data item to be displayed is input. The weight and center-of-gravity are returned from the Data Dictionary and displayed in the form

```
ITEM = GALLEY
(1) WEIGHT = 164.
(2) X C.G. = 469.
(3) Y C.G. = -67.
(4) Z C.G. = 367.
ENTER ITEM NO. (1-4) TO EDIT, OR C/R TO CONTINUE          (3-15)
```

If the user wishes to edit, he inputs the appropriate item number, i.e., 1 for weight, 2 for x, etc. SPICE then requests the new value.

3.3.3.4 Display/Modify all Data Items

Upon selection of this option, SPICE prints

```
ENTER WORD TO BEGIN PAGE 1 OR C/R FOR ENTIRE LIST.        (3-16)
```

Data item names, weights and C.G.'S are displayed alphabetically, forty items per page (see figure 2-3). If the user answers line 3-16 with a C/R, the entire Data Dictionary will be displayed. Alternatively, he can input a word or letter to begin the list. Thus if he inputs the letter S, all data items beginning with the letters S through Z will be displayed.

At the end of each page is the instruction

```
ENTER ITEM NUMBER TO EDIT OR C/R TO CONTINUE.             (3-17)
```

To edit, the user inputs the appropriate line number, after which he is prompted for the updated weight and C.G. After the final page, the program returns to the data dictionary menu (3-14).

3.3.3.5 List all Data Items

A list of all twenty-four character data item names in the Data Dictionary is displayed upon the selection of this option.

3.3.4 FLIGHT DEFINITION SUBPROCESSOR

The Flight Definition Block contains flight specific data. Figure 3-4 is a sample display for a Flight Definition Block. The items marked by a 'tic mark' are required in order to define a flight for SPICE processing. The other items can either be input by the user or calculated by other SPICE processors. If calculated, the other processor will store the results of the calculation in the data base for later use. Flights are identified by a six character alphanumeric name, called the flight number.

The menu for this subprocessor is

```
FLIGHT DEFINITION DATA MANAGEMENT OPTIONS
0.  RETURN TO DATA TYPES MENU
1.  ADD A FLIGHT TO THE DATA BASE
2.  DELETE A FLIGHT
3.  DISPLAY/MODIFY A FLIGHT
4.  ENTER SEARCH MODE
5.  LIST ALL FLIGHT NUMBERS
ENTER FLIGHT DEFINITION DATA MANAGEMENT OPTION (0-5)          (3-18)
```

3.3.4.1 Add a Flight to the Data Base

The user assigns a flight number to the new flight, then SPICE prompts him for each required parameter.

A. Baseline ID - this should be a six character identifier assigned to a previously defined baseline.
B. Previous flight number - the flight number for the previous flight on the same vehicle. Enter C/R if it is not desired for the Cargo Planning Data Processor to list both the current and previous flights.

```
                    F L I G H T   D E F I N I T I O N   B L O C K

  1  FLIGHT NUMBER                    STS-6
  2  BASELINE ID                      BAS099
  3  PREVIOUS FLIGHT
  4  VEHICLE TYPE                     OV-099
  5  LAUNCH DATE                      012283
  6  LAUNCH SITE                      ETR
  7  THROTTLE SETTINGS                102109
  8  CREW SIZE                          4
  9  MISSION LENGTH                     2
 11  EXTERNAL TANK                    ET STS-6
 12  LIGHT WEIGHT SRB                  YES
 13  SOLID ROCKET MOTOR               86-80 ETR
 14  SRB IGNITION DELAY                  2.70
 15  REDUCTION IN FPR                    0.00
 16  MAX. Q                            680.00
 17  INCLIN. OF ORBIT                   28.50
 18  ALTITUDE                          150.00
 19  INTEGRAL OMS PROP.              17925.00
 20  OMS KITS PROP.                      0.00
 21  EI DELTA RCS FWD                -1950.00
 22  EI DELTA RCS AFT                -3450.00
 23  EI DELTA OMS                   -17135.00
 24  EI DELTA NPC                    -1965.00
 25  RTLS DELTA RCS FWD               -155.00
 26  RTLS DELTA RCS AFT               -500.00
 27  RTLS DELTA OMS                 -17135.00
 28  RTLS DELTA NPC                   -270.00
 29  AOA DELTA RCS FWD               -1800.00
 30  AOA DELTA RCS AFT               -1334.00
 31  AOA DELTA OMS                  -17135.00
 32  AOA DELTA NPC                   -1040.00
 33  FLIGHT PERF MARGIN              46500.00
 34  CAPABILITY                      51187.00
 35  VEHICLE W/O CARGO              211561.00
 36    X0                             1130.77
 37    Y0                                0.46
 38    Z0                              378.44
 39  PAYLOAD CHARGE UP                1288.00
 40    X0                              906.06
 41    Y0                              -21.84
 42  PAYLOAD CHARGE DN                1288.00
 43    X0                              906.06
 44    Y0                              -21.84
 45  GETAWAY SPECIALS                  880.00
 46    X0                             1009.64
 47    Y0                              -78.77
 48    Z0                              395.47
 53  NUMBER OF PAYLOADS                  1
 54  PAYLOAD 1 ID                      TDRS

 60   PAYLOAD ATTACH DATA HAS     BEEN DEFINED

ENTER ITEM NUMBER TO EDIT OR C/R TO CONTINUE
>
```

FIGURE 3-4 FLIGHT DEFINITION DATA BLOCK

C. Vehicle type - vehicle for current flight, such as OV-102 or OV-099.
D. Launch date - day of launch in form month-day-year.
E. Launch site - ETR or WTR.
F. Maximum thrust - in the form of '109109'.
G. Crew size - number of crew members.
H. Mission length - number of days in mission.
I. External tank code - 0 for ET block I intermediate, 1 for ET block I, or 2 for ET block II.
J. Light weight SRB - yes if it is used, no if not.
K. Solid rocket engine - =1, MFSC 86-80 ETR
=2, MFSC 86-80 WTR
=3, HPM ETR
=4, HPM WTR
L. SRB ignition delay - 2.7 is normal, < 2.7 enhances performance.
M. Reduction in flight performance reserve of MPS
N. Maximum dynamic pressure (max Q)
O. Inclination of orbit
P. Flight altitude
Q. Number of payloads in cargo bay.
R. Payload identifiers - a twelve character payload ID for each payload.

Once these parameters have been input, SPICE retrieves the baseline for this flight. The categories are processed one at a time. The data items for the category are tabulated and the user enters the item numbers of the items to be included on the flight. (See method of line 3-11).

When each category has been selected, SPICE asks

DO YOU WANT TO INPUT A PAYLOAD ATTACHMENT DATA BLOCK FOR THIS FLIGHT? (3-19)

The Payload Attachment Data Block defines the precise location of each payload in the cargo bay. These locations are normally calculated in the C.G. Processor. However, if the user wishes to define specific locations, he may do so at this time.

The first step in inputting a Payload Attachment Data Block is

ENTER LEFT BRIDGE NUMBERS (1-14). C/R WHEN COMPLETE. (3-20,

The user enters the bridge numbers for all port-side bridges. This process is repeated for starboard bridges and keels.

Next, the user must define the bridge fittings required for the cargo.

ENTER LONGERON ID NUMBER. C/R WHEN COMPLETE. (3-21)

Bridge fittings are defined by an ID number. See figure 3-5 for a table of standard ID numbers and corresponding x locations. If an ID from the table is input, SPICE prints.

ENTER L FOR LEFT FITTING ONLY, R FOR RIGHT FITTING ONLY, OR C/R FOR BOTH. (3-22)

By this means, fittings can be defined 'port-side only' or 'standard-side only'. A C/R is for the standard case with fittings on both sides.

If a longeron ID number is input, but is not found on the table, SPICE prints

LONGERON ID NOT FOUND. DO YOU WISH TO INPUT NON-STANDARD FITTING? (3-23)

If a yes answer is input, SPICE prompts the user for input of fitting weight and coordinates. This process continues until all fittings for the flight are defined.

All of the flight data may now be displayed and edited. See section 3.3.4.3.

3.3.4.2 Delete a Flight

Flights are deleted by inputting the flight numbers.

3.3.4.3 Display/Modify a Flight

After the user inputs a flight number, a menu is displayed.

FLIGHT DEFINITION DISPLAY OPTIONS

FIGURE 3-5

PAYLOAD ATTACHMENT FITTINGS

Attach Pt. No.	Xo (inches)	A	P	D	N
155	612.73	x	x		
156	616.67	x	x	x	x
157	620.60	x	x	x	x
158	624.53		x	x	x
159	628.47			x	x
160	632.40			x	x
163	644.20			x	x
164	648.13			x	x
165	652.07		x	x	x
166	656.00	x	x	x	x
167	659.93	x	x	x	x
168	663.87	x	x		
169	667.80	x	x		
170	671.73	x	x		
171	675.67	x	x		
172	679.60	x	x		
177	699.27			x	x
178	703.20			x	x
179	707.13			x	x
180	711.07	x	x	x	x
181	715.00	x	x	x	x
182	718.93	x	x	x	x
183	722.87	x	x	x	x
184	726.80	x	x	x	x
185	730.73	x	x	x	x
186	734.67	x	x		
187	738.60		x		
188	742.53				x
189	746.47				x
192	758.27			x	x
193	762.20			x	x
194	766.13		x	x	x
195	770.07	x	x	x	x
196	774.00	x	x	x	x
197	777.93	x	x	x	x
198	781.87	x	x	x	x
199	785.80	x	x	x	x
200	789.73	x	x	x	x
201	793.67	x	x	x	x
202	797.60			x	x
203	801.53			x	x
206	813.33			x	x
207	817.27			x	x
208	821.20		x	x	x
209	825.13	x	x	x	x
210.	829.07	x	x	x	x
211	833.00	x	x		x
212	836.93	x	x		x

FIGURE 3-5

PAYLOAD ATTACHMENT FITTINGS (cont.)

Attach Pt. No.	Xo (inches)	A	P	D	N
213	840.87	x	x		x
214	844.80	x	x		x
215	848.73	x	x	x	x
216	852.67		x	x	x
217	856.60			x	x
218	860.53			x	x
221	872.33			x	x
222	876.27			x	x
223	880.20	x	x	x	x
224	884.13	x	x	x	x
225	888.07	x	x	x	x
226	892.00	x	x	x	x
227	895.93	x	x	x	x
228	899.87	x	x		
229	903.80	x	x		
230	907.73		x		
234	923.47			x	x
235	927.40			x	x
236	931.33			x	x
237	935.27		x	x	x
238	939.20	x	x	x	x
239	943.13	x	x	x	x
240	947.07	x	x	x	x
241	951.00	x	x	x	x
242	954.93	x	x	x	x
243	958.87	x	x	x	x
244	962.80	x	x		
245	966.73		x		
247	974.60				x
250	986.40			x	x
251	990.33			x	x
252	994.27		x	x	x
253	998.20	x	x	x	x
254	1002.13	x	x	x	x
255	1006.07	x	x	x	x
256	1010.00	x	x	x	x
257	1013.93	x	x	x	x
258	1017.87	x	x	x	x
259	1021.80	x	x	x	x
260	1025.73	x	x	x	x
261	1029.67		x	x	x
262	1033.60			x	x
263	1037.53			x	x
266	1049.33			x	x
267	1053.27			x	x
268	1057.20	x	x	x	x
269	1061.13	x	x	x	x
270	1065.07	x	x	x	x
271	1069.00	x	x	x	x

FIGURE 3-5
PAYLOAD ATTACHMENT FITTINGS (cont.)

Attach Pt. No.	Xo (inches)	A	P	D	N
272	1072.93	x	x	x	x
273	1076.87	x	x	x	x
274	1080.80			x	x
277	1092.60			x	x
278	1096.53			x	x
279	1100.47			x	x
280	1104.40			x	x
281	1108.33	x	x	x	x
282	1112.27	x	x	x	x
283	1116.20	x	x	x	x
284	1120.13	x	x	x	x
285	1124.07	x	x	x	x
286	1128.00		x	x	x
287	1131.93			x	x
288	1135.87			x	x
292	1151.60			x	x
293	1155.53		x	x	x
294	1159.47	x	x	x	x
295	1163.40	x	x	x	x
296	1167.33	x	x	x	x
297	1171.27	x	x	x	x
298	1175.20	x	x	x	x
299	1179.13		x		x
304	1198.80				x
305	1202.73				x
306	1206.67	x	x	x	x
307	1210.60	x	x	x	x
308	1214.53	x	x	x	x
309	1218.47	x	x	x	x
310	1222.40	x	x	x	x
311	1226.33	x	x	x	x
312	1230.27			x	x
313	1234.20			x	x
314	1238.13			x	x
315	1242.07			x	x
316	1246.00			x	x
322	1269.60				x
323	1273.53			x	x
324	1277.47			x	x
325	1281.40			x	x

A = Active Keel
P = Passive keel
D = Deployable fitting
N = Non-deployable fitting

0. RETURN TO FLIGHT DATA MANAGEMENT MENU
1. DISPLAY FLIGHT DEFINITION PARAMETERS
2. DISPLAY DATA CATEGORIES AND ITEMS
3. DISPLAY PAYLOAD ATTACHMENT DATA
SELECT DISPLAY OPTION [0-3] (3-24)

3.3.4.3.1 Display Flight Definition Parameters

See figure 3-4 for an example of this display. Parameters can be edited by inputting the item number. If a 1 is input, the user can input a new flight number. This will result in adding a new flight to the file, without deleting the old flight. The displayed flight parameters, with all edits, will be stored as a new flight. After the new flight number is entered, SPICE asks

DO YOU WISH TO ZERO OUT CALCULATABLE ITEMS? (3-25)

If it is desired, the non-required parameters in the Flight Definition Block will all be set to zero for the newly created flight. SPICE will also ask

DO YOU WISH TO DELETE THE PAYLOAD ATTACHMENT BLOCK? (3-26)

If no is entered, the new flight will be assigned a copy of the same Payload Attachment Data Block as the old flight. Otherwise, the new flight will not be assigned a Payload Attachment Data Block at this time.

3.3.4.3.2 Display Data Categories and Items

With this option, the baseline for the flight is retrieved and a tabulation of the category names is presented. The user may select one category to edit or C/R to edit all of them. The data items are displayed by category. All items previously selected for the flight are marked with asterisks. The user can enter item numbers for each selected item to be unselected, and for unselected items to be selected.

3.3.4.3.3 Display Payload Attachment Data

If this option is selected, and no Payload Attachment Data Block has been defined for this flight, then the user can input a Payload Attachment Data Block. (See Instructions beginning with line 3-20).

If the Payload Attachment Data Block was previously input, it is now displayed as in figure 3-6. The user is given the option to edit the data. To begin editing, SPICE prints

ENTER LEFT BRIDGES TO BE DELETED. C/R IF FINISHED. (3-27)

The user enters the numbers of port-side bridges which were previously required but are now to be deleted.

Next, the user selects port-side bridges to be added to the flight. This process is repeated for starboard bridges, keels and longeron fittings. If longerons are added, the user must input weight and coordinates, in addition to the ID number.

3.3.4.4 Search Mode

Search mode acts as a query language for the data base. All flights on the data base are searched, in order to find those satisfying certain criteria. A list of parameters that can be specified is printed on the screen.

VALUES FOR THE FOLLOWING FLIGHT PARAMETERS MAY BE SPECIFIED.

1. BASELINE ID	2. VEHICLE TYPE	3. YEAR OF LAUNCH
4. LAUNCH SITE	5. CREW SIZE	6. MISSION LENGTH
7. THROTTLE SETTINGS	8. EXTERNAL TANK	9. LIGHT WEIGHT SRB
10. SOLID ROCKET MOTOR	11. PAYLOAD ID (MAY BE SPECIFIED UP TO 6 TIMES)	

ENTER PARAMETER NUMBER TO BE SPECIFIED (1-11). C/R WHEN COMPLETE. (3-28)

The user may specify as many parameters as desired, and any combination of parameters. For example, to find all flights in 1985 on the OV-099 vehicle would involve the following input sequence.

> 2
> OV-099
> 3
> 85
> C/R

```
          PAYLOAD ATTACHMENT DATA BLOCK FOR FLIGHT  STS-6

BRIDGE NUMBERS   1   2   3   4   5   6   7   8   9  10  11  12  13  14
 LEFT                                             X       X   X
 RIGHT                                            X       X   X

KEEL   NUMBERS   1   2   3   4   5   6   7   8   9  10  11  12
                                                 X

  NUMBER OF LONGERONS =  3

LONGERON ID          269         293         311
LONGERON WEIGHT     62.00       62.00       62.00
LONGERON X0       1061.13     1155.53     1226.33
LONGERON Y0          0.00        0.00        0.00
LONGERON Z0        404.00      404.00      404.00

DO YOU WISH TO EDIT? (Y OR N)
>
```

FIGURE 3-8 PAYLOAD ATTACHMENT DATA BLOCK

When all desired parameters have been specified, SPICE will list the specified parameters and their values. All of the defined flights will be examined and the flight numbers listed for those satisfying the criteria are displayed.

```
REQUIRED PARAMETERS ARE:
VEHICLE TYPE        = OV-099
YEAR OF LAUNCH      = 85
THE FOLLOWING FLIGHTS MEET THESE SPECIFICATIONS:
AAAAAA
BBBBBB
CCCCCC
3 FLIGHTS WERE FOUND TO SATISFY THE REQUIRED CONDITIONS.          (3-30)
```

3.3.4.5 List all Flight Numbers

This option results in a tabulation of all flight numbers on the file.

3.3.5 PAYLOAD DATA MANAGEMENT SUBPROCESSOR

The Payload Data Block contains various payload-specific parameters. Included are the carrier ID, orbits, weights up and down, lengths, and centers-of-gravity. For payloads constrained to a single location in the cargo bay, a Payload Attachment Data Block may be defined for the payload. In this case, centers-of-gravity are in orbiter coordinates. Otherwise, C. G. coordinates are relative to the keel of the carrier. Figure 3-7 is a typical Payload Data Block. The menu for this subprocessor is

```
PAYLOAD DEFINITION DATA MANAGEMENT OPTIONS
0.   RETURN TO DATA TYPES MENU
1.   ADD A PAYLOAD TO THE DATA BASE
2.   DELETE A PAYLOAD
3.   DISPLAY/MODIFY A PAYLOAD
4.   DISPLAY/MODIFY PAYLOAD ATTACHMENT DATA
5.   ENTER SEARCH MODE
6.   LIST ALL PAYLOAD IDS
ENTER PAYLOAD DEFINITION DATA MANAGEMENT OPTION (0-6)             (3-31)
```

```
                    P A Y L O A D   D A T A   B L O C K

  1  PAYLOAD ID                          TELESAT
  2  PAYLOAD NAME                        TELESAT/SSUS-D  (ANIK)
  3  PAYLOAD MISSION TYPE                D
  4  DISCIPLINE CODE                     COMM
  5  USER NAMES                          FOREIGN
  6  SUBSET OF FLIGHT ELEMENT            UPPER STG
  7  PAYLOAD CODE                        ABFG08
  8  CARRIER ID                          TEL-D
  9  REPEAT FLAG                         0
 10  PAYLOAD WEIGHT UP                      7532.00
 11  PAYLOAD WEIGHT DOWN                       0.00
 12  PAYLOAD LENGTH UP                        86.00
 13  PAYLOAD LENGTH DOWN                       0.00
     DEPLOYMENT ORBIT
 14      HEIGHT AT APOGEE                    160.00
 15      HEIGHT AT PERIGEE                   160.00
 16      ANGLE OF INCLINATION                 28.50
     TRANSFER ORBIT
 17      HEIGHT AT APOGEE                  19323.00
 18      HEIGHT AT PERIGEE                   160.00
 19      ANGLE OF INCLINATION                 25.50
     FINAL ORBIT
 20      HEIGHT AT APOGEE                  19324.00
 21      HEIGHT AT PERIGEE                 19324.00
 22      ANGLE OF INCLINATION                  0.00
 23  DURATION                                  1.00
 24  C. G. UP              X =                35.39
 25                        Y =                 0.03
 26                        Z =               381.58
 27  C. G. DOWN            X =                 0.00
 28                        Y =                 0.00
 29                        Z =                 0.00
 30  PAYLOAD DIAMETER                         86.00
 31  POWER REQUIREMENTS                        0.00
 32  REQUIRED FRONT CLEARANCE                 36.00

 33          18 YEAR FLIGHT FREQUENCIES
       YEAR     1  2  3  4  5  6  7  8  9  10 11 12 13 14 15 16 17 18
                1  1  1  1  1  0  1  0  0  0  1  0  0  0  0  0  0  0

 34   PAYLOAD ATTACH DATA HAS NOT BEEN DEFINED

ENTER ITEM NUMBER TO EDIT OR C/R TO CONTINUE
>
```

FIGURE 3-7 PAYLOAD DATA BLOCK

3.3.5.1 Add a Payload to the Data Base

Payloads are identified by a twelve character ID. A payload ID is assigned to the new payload by the user. SPICE then prompts him for input of each parameter. Once all parameters have been input, the entire data block is displayed and can be edited as in section 3.3.5.3. The user will also be given the opportunity to input a Payload Attachment Data Block. See section 3.3.4.1 at line 3-19 for the input method.

3.3.5.2 Delete a Payload

Payloads are deleted by inputting the twelve character payload ID.

3.3.5.3 Display/Modify a Payload

The payload parameters are displayed as in figure 3-7. As usual, the user may change any values by first entering the item number. As in the case of carriers and flights, a new Payload Data Block may be created by editing the payload ID, item one.

3.3.5.4 Display/Modify Payload Attachment Data

The Payload Attachment Data Block may be displayed and edited by entering the payload ID. If no Payload Attachment Data Block exists, it may be input. See section 3.3.4.3.3

3.3.5.5 Search Mode

The payload search mode is similar to that for flights, except for the parameters that may be specified. These are

A.	Payload mission type	-Four types of missions with letter codes A = attached D - deployed R = retrieved S = serviced
B.	Discipline code	-18 alphanumeric characters which describe the category of the mission. E.G. 'ENVIR MON' 'EARTH OBSERV', 'TECHNOLOGY'.
C.	Payload code	-required by 'SAMPLE' program
D.	Carrier code	-carrier assigned to the payload
E.	Number of flights per year	-number of flights by the payload scheduled in a given year.

3.3.5.6 List All Payload Identifiers

A tabulation of all payloads on the flight is displayed by this option.

3.4 SAMPLE PAYLOAD DATA PROCESSOR

SAMPLE is an interactive program for automatically generating traffic models and flight schedules for STS. SAMPLE stands for Scheduling Algorithm for Mission Planning and Logistics Evaluation. The SAMPLE program is not part of SPICE, but SPICE will create an input file for SAMPLE, based on payloads data from the STS Master Data Base.

The first task in this processor is to input a header for the SAMPLE input file. The header consists of a maximum of seventy-two alphanumeric characters, typed as a single line.

After the header is input, an option menu is displayed

ENTER OPTION FOR PAYLOADS DATA:
0. RETURN TO EXECUTIVE
1. LIST ALL PAYLOADS ON DATA BASE
2. PROCESS ALL PAYLOADS FOR SAMPLE
3. SPECIFY PAYLOADS TO BE OUTPUT FOR SAMPLE (3-32)

3.4.1 LIST ALL PAYLOADS ON DATA BASE

This option produces a tabulation of all payload identifiers available in the data base.

3.4.2 PROCESS ALL PAYLOADS FOR SAMPLE

For each payload, the data required by SAMPLE will be extracted from the data base and written to the SAMPLE Input File.

3.4.3 SPECIFY PAYLOADS TO BE OUTPUT FOR SAMPLE

The user enters the appropriate identifier for each payload to be processed by SAMPLE. SPICE extracts the required data from the data base and writes it to the SAMPLE Input File.

3.5 CARGO PLANNING DATA PROCESSOR

The Cargo Planning Data Processor calculates mass properties and performance for a specified flight. It produces a data pack listing of the mass properties with the individual baseline items included.

This processor begins with the execution mode selection. Normal, fast, batch, and debug are available. Fast mode will result in the suppression of the initial pages of the data pack -- only the configuration and performance pages will be printed. Batch mode is used to save the data pack listing in a temporary file rather than print it on the CRT screen. The output will be stored in a temporary file which has its file name identical to the flight number. When the user exits from SPICE and before he terminates his computer run, he must copy the temporary file to a permanent location if he wishes to save it. For instance, if a flight numbered STS-1 was executed in the batch mode, it may be saved in a file named SAVEFILE by the Univac EXEC 8 command,

```
@COPY,I STS-1.,SAVEFILE.STS-1                                    (3-33)
```

The flight to be processed is selected by inputting its flight number. SPICE retrieves the flight from the STS Master Data Base. It checks for a valid baseline and retrieves it. If the flight definition specified the previous flight, then that flight is retrieved and checked for compatibility. Both flights must reference the same baseline, or they are incompatible. In that case, either a new flight must be selected or the processor exits.

In order to calculate mass properties and performance, OMS requirements and propulsive consumables delta values must have been previously calculated. Also a Payload Attachment Data Block must be defined. This data can be input in the Data Base Management Processor, but is usually calculated by the C.G. Processor and saved in the data base. SPICE checks the Flight Definition Block for this data and prints this display:

```
AVAILABILITY OF PREDEFINED DATA
CURRENT FLIGHT AAAAAA
7  OMS PROPELLANT              YES/NO
8  PAYLOAD ATTACHMENT DATA     YES/NO
9  EI                          YES/NO
```

```
10  RTLS          YES/NO
11  AOA           YES/NO                                        (3-34)
```

If a parameter is followed by a 'YES', then the parameter is available in the Flight Definition Block. A 'NO' signifies that it is not available in order to execute the processor. If the Payload Attachment Data Block is not defined, the user must go to the Data Base Management Processor or the C.G. Processor to create it. Any other missing parameter may be typed in at this time. For example, consider a flight where all items are marked 'YES', except for item 7 -- current flight OMS propellant. The following input sequence will set OMS propellant to 24000 pounds and allow the user to proceed with the data pack.

```
>7
ENTER INTEGRAL OMS PROPELLANT>24000.                            (3-35)
ENTER OMS KIT PROPELLANT>0.
```

After the display of line 3-34 and all desired changes, the user enters a C/R. If all parameters were avilable. The processor continues normal execution. If not, a message is printed and the user is invited to choose another flight to execute.

The user is now asked

```
DO YOU WISH TO INPUT CHARGEABLES                                (3-36)
```

A yes answer informs SPICE that the chargeable items will be input line-by-line at the terminal. Each item requires a twenty-four character name, weight, and X, Y, and Z coordinates. The user is prompted first for items to be charged under 'STS OPERATOR UP'. This is followed by 'STS OPERATOR DOWN', and payload charges up and down for each cargo element. The user will be prompted for these items during production of the data pack.

A no answer to question (3-36) directs the program to calculate chargeables based on ground rules built into the program. Figure 3-8E was generated via these ground rules.

Next the user must select the performance calculation option. Performance margin may be calculated using trajectories shaped nominal and/or abort.

SELECT PERFORMANCE CALCULATION OPTION

1. SHAPED NOMINAL PERFORMANCE
2. SHAPED AOA PERFORMANCE
3. NOMINAL AND AOA PERFORMANCE (3-37)

Production of the data pack will now begin.

Figure 3-8 is a sample data pack for a flight designated 'STS-5'.

The first two pages are a listing of the mass properties of the various categories from the vehicle baseline. There are two columns for mass. The first column is for the previous flight, which is not present in this example. '0.0' signifies an item which is not present on the flight.

Next is a breakdown of each cargo element, which gives the weight and center-of-gravity, both up and down. Thus in the example, figure 3-8C, cargo element one is an SBS satellite. Going up, it consists of the payload and an ASE (aero support equipment). The payload is deployed and the cargo element down consists only of the ASE.

Figure 3-8D is a tabulation of discretionary payloads and the payload attachment hardware to be carried on the flight. Discretionary payloads include orbiter, in-cabin, and get-away special experiments. The negative entry for payload attachment hardware is to balance the 'bridge and keel allowance' carried under the vehicle inert category.

The chargeables page lists items charged to the STS operator up and down, plus any payload chargeable items. If the user answered yes to question 3-36, he must input the chargeables at this time.

The orbiter configuration page, figure 3-8G, shows the total weights of the vehicle without cargo, with cargo up, and with cargo down. This is followed by a cargo configuration page which summarizes the various cargo elements.

The final pages of the data pack, figures 3-8I and 3-8H, are the flight performance pages. These pages show the calculation of the performance margin, calculated via shaped nominal and/or shaped AOA trajectories. They also show the weight and center-of-gravity of the vehicle during nominal entry, RTLS,

FLIGHT CONFIGURATION STS-5 18-16-81 14:34:55

OV102M BASELINE WT = 155338.0

	PREV FLT	STS-5	X0	Y0	Z0
VEHICLE INERT					
OV102M INERT (DERIVED)	0.0	152321.0	1058.2	-0.3	365.8
BRIDGE&KEEL ALLO.	0.0	675.0	1074.0	26.0	395.0
RMS INST & JET CNTL	0.0	379.0	973.1	-89.5	410.9
EPS 3 PLUMBING	0.0	271.0	919.3	-20.4	303.9
EPS 3/102 TANK	0.0	604.0	1048.4	-14.8	299.4
FLT DECK SEAT (MS)	0.0	55.0	564.0	32.0	429.0
MID DECK SEAT 2	0.0	55.0	494.0	-28.0	340.0
SUBTOTAL	0.0	154360.0			
CG: X0	0.0	1057.4			
Y0	0.0	-0.5			
Z0	0.0	365.7			
MAIN ENGINE					
SSMEX3 OV102M	0.0	20709.0	1494.0	0.0	384.1
SUBTOTAL	0.0	20709.0			
CG: X0	0.0	1494.0			
Y0	0.0	0.0			
Z0	0.0	384.1			
FLIGHT KITS					
EPS 4 PLUMBING	0.0	184.0	894.6	-13.6	299.1
EPS 4 TANK	0.0	595.0	965.5	-1.3	302.1
ATCS PANEL	0.0	355.0	1214.9	-0.1	473.3
SMCH CABLE STS-5	0.0	659.0	901.0	-13.0	340.0
P/L RECORDER	0.0	60.0	421.0	-6.0	378.0
1307 CABLE	0.0	80.0	1255.0	0.0	340.0
AFD HARNESS	0.0	40.0	570.0	-75.0	408.0
STD SWITCH P1	0.0	20.5	560.0	-60.0	450.0
STD SWITCH P2	0.0	20.5	560.0	-60.0	450.0
AUX 02 HDWR	0.0	75.0	794.0	89.0	329.0
P/L TIMING BUFFER	0.0	3.0	560.0	-60.0	450.0
BALLAST PROVISIONS	0.0	22.0	1307.0	0.0	410.0
STS-5 DFI SCAR	0.0	4952.0	959.2	11.5	363.4
GAS CONTROLLER	0.0	4.0	560.0	-40.0	450.0
SUBTOTAL	0.0	7070.0			
CG: X0	0.0	958.7			
Y0	0.0	6.4			
Z0	0.0	360.4			

ENTER A C/R TO CONTINUE

>

FIGURE 3-8a CARGO PLANNING DATA PACK

	PREV FLT	STS-5	X0	Y0	Z0
PERSONNEL					
DELTA TO 4M/ 5D	0.0	-90.0	512.3	5.7	368.8
CREW & EQUIPMENT	0.0	3061.0	505.7	3.2	380.6
SLEEPING BAGS(4)	0.0	36.0	485.1	66.5	364.2
DELTA FOR GALLEY C/O	0.0	60.0	469.0	-67.0	367.0
CBSA/BEAM 5	0.0	558.0	825.0	80.9	393.8
PERS DELTA STS-5	0.0	-31.0	82.0	-51.0	385.7
SUBTOTAL	0.0	3594.0			
CG: X0	0.0	557.9			
Y0	0.0	15.1			
Z0	0.0	382.4			
NON PROPULSIVE CONS					
2 EPS TANKS	0.0	3876.0	974.8	-3.3	354.1
DELTA FOR 3RD TANK	0.0	873.0	1104.3	44.1	297.6
RESIDUALS TK 4	0.0	27.0	1040.8	-56.1	299.3
NPC DELTA STS-5	0.0	1126.0	814.8	-14.8	354.0
SUBTOTAL	0.0	5902.0			
CG: X0	0.0	963.7			
Y0	0.0	1.3			
Z0	0.0	345.5			
PROPULSIVE CONSUM					
OV102M OMS PROPELLANT	0.0	20405.0	1417.1	0.0	475.9
MPS FPR NOM 3 SIG	0.0	5551.0	1408.3	12.9	355.2
RCS PROPELLANT FWD/102	0.0	2464.0	318.6	5.5	364.5
RCS PROP. AFT O/F	0.0	5424.0	1345.0	0.0	489.7
SUBTOTAL	0.0	33844.0			
CG: X0	0.0	1324.1			
Y0	0.0	2.5			
Z0	0.0	447.0			

ENTER A C/R TO CONTINUE
>

FIGURE 3-8b CARGO PLANNING DATA PACK

			STS-5	X0	Y0	Z0
CARGO ELEMENT 1	UP					
ASE SBS		0.0	2394.0	934.5	11.5	368.8
PAYLOAD -	SBS	0.0	7351.0	935.3	-0.0	380.6
	SUBTOTAL	0.0	9745.0			
	CG: X0	0.0	935.1			
	Y0	0.0	2.8			
	Z0	0.0	377.7			
CARGO ELEMENT 1	DOWN					
ASE/SBS		0.0	2394.0	934.5	11.5	368.8
	SUBTOTAL	0.0	2394.0			
	CG: X0	0.0	934.5			
	Y0	0.0	11.5			
	Z0	0.0	368.8			
CARGO ELEMENT 2	UP					
ASE		0.0	2394.0	1095.7	11.5	368.8
PAYLOAD -	TELESAT-E	0.0	7365.0	1096.5	-0.0	381.0
	SUBTOTAL	0.0	9759.0			
	CG: X0	0.0	1096.3			
	Y0	0.0	2.8			
	Z0	0.0	378.0			
CARGO ELEMENT 2	DOWN					
ASE		0.0	2394.0	1095.7	11.5	368.8
	SUBTOTAL	0.0	2394.0			
	CG: X0	0.0	1095.7			
	Y0	0.0	11.5			
	Z0	0.0	368.8			
CARGO ELEMENT 3	UP					
CARRIER -	MPESS	0.0	1185.0	1228.3	0.0	386.0
PAYLOAD -	OSTA-2	0.0	3512.0	1217.1	-3.5	419.9
	SUBTOTAL	0.0	4697.0			
	CG: X0	0.0	1219.9			
	Y0	0.0	-2.6			
	Z0	0.0	411.4			
CARGO ELEMENT 3	DOWN					
CARRIER -	MPESS	0.0	1185.0	1228.3	0.0	386.0
PAYLOAD -	OSTA-2	0.0	3512.0	1217.1	-3.5	419.9
	SUBTOTAL	0.0	4697.0			
	CG: X0	0.0	1219.9			
	Y0	0.0	-2.6			
	Z0	0.0	411.4			

FIGURE 3-8C CARGO PLANNING DATA PACK

ENTER A C/R TO CONTINUE

		STS-5	X0	Y0	Z0
DISCRETIONARY PAYLOADS					
GETAWAY SPECIALS	0.0	880.0	1009.6	-78.8	395.5
ACIP	0.0	182.0	1160.0	2.5	348.6
ACIP RECORDER	0.0	94.0	480.0	1.8	317.6
MLR	0.0	169.0	437.3	14.8	355.8
SUBTOTAL	0.0	1325.0			
CG: X0	0.0	919.7			
Y0	0.0	-50.0			
Z0	0.0	378.4			
PAYLOAD ATTACH HARDWARE					
BRIDGE 6	0.0	216.0	891.0	0.0	404.0
KEEL 6	0.0	188.0	891.0	0.0	305.0
BRIDGE 7	0.0	264.0	949.3	0.0	404.0
BRIDGE 9	0.0	208.0	1065.2	0.0	404.0
KEEL 9	0.0	219.0	1065.2	0.0	305.0
BRIDGE 10	0.0	228.0	1115.5	0.0	404.0
BRIDGE 12	0.0	276.0	1220.0	0.0	404.0
KEEL 12	0.0	327.0	1220.0	0.0	308.4
LONG FIT 227	0.0	62.0	895.9	0.0	404.0
LONG FIT 247	0.0	62.0	974.6	0.0	404.0
LONG FIT 268	0.0	62.0	1057.2	0.0	404.0
LONG FIT 288	0.0	62.0	1135.9	0.0	404.0
LONG FIT 308	0.0	62.0	1214.5	0.0	404.0
LONG FIT 315	0.0	62.0	1242.1	0.0	404.0
BRIDGE&KEEL	0.0	-675.0	1074.0	26.0	395.0
SUBTOTAL	0.0	1623.0			
CG: X0	0.0	1068.8			
Y0	0.0	-10.8			
Z0	0.0	363.7			

ENTER A C/R TO CONTINUE
>

FIGURE 3-8D CARGO PLANNING DATA PACK

		STS-5	X0	Y0	Z0
STS OPERATOR UP					
EPS 4 PLUMBING	0.0	184.0	894.6	-13.6	299.1
EPS 4 TANK	0.0	595.0	966.5	-1.3	302.1
ATCS PANEL	0.0	355.0	1214.9	-0.1	473.3
SMCH CABLE STS-5	0.0	659.0	901.0	-13.0	340.0
P/L RECORDER	0.0	60.0	421.0	-6.0	378.0
1307 CABLE	0.0	80.0	1255.0	0.0	340.0
AFD HARNESS	0.0	40.0	570.0	-75.0	408.0
STD SWITCH P1	0.0	20.5	560.0	-60.0	450.0
STD SWITCH P2	0.0	20.5	560.0	-60.0	450.0
AUX 02 HDWR	0.0	75.0	794.0	89.0	329.0
P/L TIMING BUFFER	0.0	3.0	560.0	-60.0	450.0
BALLAST PROVISIONS	0.0	22.0	1307.0	0.0	410.0
STS-5 DFI SCAR	0.0	4952.0	959.2	11.5	363.4
GAS CONTROLLER	0.0	4.0	560.0	-40.0	450.0
ATTACH HARDWARE	0.0	1623.0	1068.8	-10.8	363.7
SUBTOTAL	0.0	8693.0			
CG: X0	0.0	979.2			
Y0	0.0	3.2			
Z0	0.0	361.0			
STS OPERATOR DN					
EPS 4 PLUMBING	0.0	184.0	894.6	-13.6	299.1
EPS 4 TANK	0.0	595.0	965.5	-1.3	302.1
ATCS PANEL	0.0	355.0	1214.9	-0.1	473.3
SMCH CABLE STS-5	0.0	659.0	901.0	-13.0	340.0
P/L RECORDER	0.0	60.0	421.0	-6.0	378.0
1307 CABLE	0.0	80.0	1255.0	0.0	340.0
AFD HARNESS	0.0	40.0	570.0	-75.0	408.0
STD SWITCH P1	0.0	20.5	560.0	-60.0	450.0
STD SWITCH P2	0.0	20.5	560.0	-60.0	450.0
AUX 02 HDWR	0.0	75.0	794.0	89.0	329.0
P/L TIMING BUFFER	0.0	3.0	560.0	-60.0	450.0
BALLAST PROVISIONS	0.0	22.0	1307.0	0.0	410.0
STS-5 DFI SCAR	0.0	4952.0	959.2	11.5	363.4
GAS CONTROLLER	0.0	4.0	560.0	-40.0	450.0
ATTACH HARDWARE	0.0	1623.0	1068.8	-10.8	363.7
SUBTOTAL	0.0	8693.0			
CG: X0	0.0	979.2			
Y0	0.0	3.2			
Z0	0.0	361.0			

ENTER A C/R TO CONTINUE
>

FIGURE 3-8E CARGO PLANNING DATA PACK

ORBITER CONFIGURATION
STS-5

* * * TOTAL: VEHICLE W/O CARGO

DESCRIPTION	WGT	X0	Y0	Z0
VEHICLE INERT	154360.0	1057.4	-0.5	365.7
MAIN ENGINE	20709.0	1494.0	0.0	384.1
FLIGHT KITS	7070.0	958.7	6.4	360.4
PERSONNEL	3594.0	557.9	15.1	382.4
NON-PROPULSIVE CONSUM	5902.0	963.7	1.3	345.5
PROPULSIVE CONSUMABLES	33844.0	1324.1	2.5	447.0
TOTAL	225479.0	1124.0	0.5	379.1

* * * TOTAL: VEHICLE WITH CARGO UP

DESCRIPTION	WGT	X0	Y0	Z0
VEHICLE W/O CARGO	225479.0	1124.0	0.5	379.1
CARGO ELEMENT 1 UP	9745.0	935.1	2.8	377.7
CARGO ELEMENT 2 UP	9759.0	1096.3	2.8	378.0
CARGO ELEMENT 3 UP	4697.0	1219.9	-2.6	411.4
DISCRETIONARY PAYLOADS	1325.0	919.7	-50.0	378.4
ATTACH HARDWARE	1623.0	1068.8	-10.8	363.7
TOTAL	252628.0	1116.0	0.3	379.5

* * * TOTAL: VEHICLE WITH CARGO DOWN

DESCRIPTION	WGT	X0	Y0	Z0
VEHICLE W/O CARGO	225479.0	1124.0	0.5	379.1
CARGO ELEMENT 1 DOWN	2394.0	934.5	11.5	368.8
CARGO ELEMENT 2 DOWN	2394.0	1095.7	11.5	368.8
CARGO ELEMENT 3 DOWN	4697.0	1219.9	-2.6	411.4
DISCRETIONARY PAYLOADS	1325.0	919.7	-50.0	378.4
ATTACH HARDWARE	1623.0	1068.8	-10.8	363.7
TOTAL	237912.0	1122.2	0.3	379.5

ENTER A C/R TO CONTINUE
>

FIGURE 3-8F CARGO PLANNING DATA PACK

CARGO CONFIGURATION
STS-5

DATE 12-15-81 LAUNCH 11-11-82
VEH OV102M INC 28.5
CREW SIZE-FLIGHT DURATION 4M/ 5D ORB 160.0

CARGO IDENT:		COMPOSITE CARGO UP		COMPOSITE CARGO DOWN	
SBS	WT (LB)	34219.0		WT (LB)	19503.0
TELESAT-E	CG (IN)	X0	1030.8	CG (IN) X0	1042.0
OSTA-2		Y0	0.1	Y0	0.2
		Z0	378.2	Z0	376.2

CARGO ELEMENT 1 SBS				CARGO ELEMENT 2 TELESAT-E			
WT UP	9745.0	DN	2394.0	WT UP	9759.0	DN	2394.0
X0	935.1	X0	934.5	X0	1096.3	X0	1095.7
Y0	2.8	Y0	11.5	Y0	2.8	Y0	11.5
Z0	377.7	Z0	368.8	Z0	378.0	Z0	368.8

CARGO ELEMENT 3 OSTA-2			
WT UP	4697.0	DN	4697.0
X0	1219.9	X0	1219.9
Y0	-2.6	Y0	-2.6
Z0	411.4	Z0	411.4

STS OPERATOR				DISCRETIONARY PAYLOADS			
WT UP	8693.0	DN	8693.0	WT UP	1325.0	DN	1325.0
X0	979.2	X0	979.2	X0	919.73	X0	919.77
Y0	3.2	Y0	3.2	Y0	-50.08	Y0	-50.05
Z0	361.0	Z0	361.0	Z0	378.40	Z0	378.48

ENTER A C/R TO CONTINUE
>

FIGURE 3-8Q CARGO PLANNING DATA PACK

F L I G H T P E R F O R M A N C E SHAPED AOA

12/15/81

STS-5 (13000-6P)
PAYLOADS SBS
TELESAT-E
OSTA-2

LAUNCH DATE 11/11/82 ETR
CREW/DURATION 4M/ 6D
INCLINATION 28.5
ALTITUDE 160. N.M.
REF: JSC-09095-60

ITEM		WEIGHT
REFERENCE WGT TO MECO (BRM)		344499.
PERFORMANCE ENHANCEMENTS:	WTR SRB	0.
	LIGHT WT SRB	-265.
CHANGE IN QMAX TO 680 PSF		833.
SSME THROTTLE SETTINGS 102/109%		-7000.
CHANGE IN INCLINATION TO 28.50		0.
	HPM	0.
NOMINAL ET MARGIN REQUIRED		0.
VARIABLE IY (I>30)		0.
CAPABILITY TO MECO		338067.
ET STS-5		-76603.
OV102M INERT (3 EPS)		-155338.
MANIFEST CHANGES		978.
RMS		
FLT DECK SEAT (PS)		
MID DECK SEAT 1		
SSME X 3		-20709.
NONPROPULSIVE CONSUM. (3.0 EPS)		-5902.
STS WEIGHT CHARGED TO OPERATOR		-8693.
PERSONNEL (4M/ 5D)		-3594.
UNUSABLE FLUIDS (MPS)		-8798.
MPS FPR (NOMINAL 3-SIG)		-5551.
OMS PROPELLANT		-20405.
RCS PROPELLANT (AFT)		-5424.
RCS PROPELLANT (FWD)		-2464.
DDT&E MANAGEMENT RESERVE		0.
CAPABILITY		25564.
STS OPERATIONS RESERVE		-3000.
P/L REQUIREMENT		-25526.
PRINCIPAL PAYLOADS	24201.	
DISCRETIONARY PAYLOADS	1325.	

****
* *
* MARGIN = -2962. *
* *
****

NOMINAL ENTRY (MACH 3)	RTLS	AOA (MACH 3)
WT (LB) 204471.0	WT (LB) 230484.0	WT (LB) 223179.0
CG (IN)	CG (IN)	CG (IN)
X 1092.3 % 66.2	X 1088.4 % 65.9	X 1087.8 % 65.9
Y 0.1	Y 0.3	Y 0.0
Z 370.3	Z 371.3	Z 371.3

ENTER A C/R TO CONTINUE

FIGURE 3-8H

```
                F L I G H T   P E R F O R M A N C E      SHAPED NOMINAL
                                                                  12/15/81
STS-5      (13000-6P     )          LAUNCH DATE   11/11/82  ETR
PAYLOADS     SBS                    CREW/DURATION  4M/ 5D
             TELESAT-E              INCLINATION    28.5
             OSTA-2                 ALTITUDE       160. N.M.
                                    REF1           JSC-09095-60


             ITEM                                        WEIGHT
REF WGT TO NOMINAL MECO (JSC-17332)                      341086.
      QMAX = 680.
      MONTH= NOVEMBER
      MOTOR= 86-80 ETR
THROTTLE/INCLIN. (%THROT=102, INC= 28.5)                      0.
HEAVY WEIGHT MOTOR                                         -965.
SRB IGNITION DELAY  (2.70)                                    0.
MPS AT MECO TO INJECTED WEIGHT                                0.
DAY OF LAUNCH ADJUSTMENT                                     88.
CAPABILITY TO NOMINAL MECO                               340209.
ET STS-5                                                 -76603.
OV102M INERT (3 EPS)                                    -155338.
MANIFEST CHANGES                                            978.
   RMS
   FLT DECK SEAT (PS)
   MID DECK SEAT 1
SSME X 3                                                 -20709.
NONPROPULSIVE CONSUM.  (3.0 EPS)                          -5902.
STS WEIGHT CHARGED TO OPERATOR                            -8693.
PERSONNEL  (4M/ 5D)                                       -3594.
UNUSABLE FLUIDS  (MPS)                                    -8798.
MPS FPR  (NOMINAL 3-SIG)                                  -5551.
OMS PROPELLANT                                           -20405.
RCS PROPELLANT  (AFT)                                     -5424.
RCS PROPELLANT  (FWD)                                     -2464.
DDT&E MANAGEMENT RESERVE                                      0.
CAPABILITY                                               27706.
STS OPERATIONS RESERVE                                   -3000.
P/L REQUIREMENT                                          -25526.
   PRINCIPAL PAYLOADS          24201.
   DISCRETIONARY PAYLOADS       1325.

                          **********************************
                          *                                *
                          *   MARGIN =   -820.             *
                          *                                *
                          **********************************

NOMINAL ENTRY (MACH 3)        RTLS                    AOA (MACH 3)
  WT (LB) 204471.0          WT (LB) 230484.0        WT (LB) 223179.0
  CG (IN)                   CG (IN)                 CG (IN)
      X  1092.3  % 66.2          X  1088.4  % 65.9        X  1087.8  % 65.9
      Y     0.1                  Y     0.3                Y     0.0
      Z   370.3                  Z   371.3                Z   371.3

ENTER A C/R TO CONTINUE                                   FIGURE 3-8I
```

and AOA. If both nominal and AOA performance were calculated, the user will be asked

DO YOU WANT TO SEE A COMPOSITE PERFORMANCE LISTING? (3-38)

A yes answer results in a level A performance assessment display, figure 3-9. This display essentially combines the information from the two performance pages into one page.

Next the user is asked

DO YOU WISH TO SEE THE FLIGHT SUMMARY PAGE? (3-39)

The flight summary page is a short summary of the parameters required to calculate flight performance. See figure 3-10.

This concludes the execution of the Cargo Planning Data Processor. The user may now select another flight and repeat the process or he can return to the SPICE executive.

3.6 C. G. PROCESSOR

The C. G. Processor determines allowable positioning of payloads in the cargo bay, according to center-of-gravity and geometrical restraints. It also calculates the amount of OMS propellant necessary for ascent, on-orbit maneuvering and descent. It calculates and displays the weight and center-of-gravity of the vehicle during nominal entry, abort-once-around (AOA), and return to launch site (RTLS). Additional options include deployment contingencies, ballast, beam-mounted Getaway Specials, and maximum altitude calculations.

Execution of the processor begins with the selection of the execution mode and the entering of a flight number to be processed. The required flight, baseline, payload and carrier data is retrieved and checked for compatibility. If the total cargo is too long or too heavy or requires different altitudes, the user may decide not to continue.

LEVEL A PERFORMANCE ASSESSMENT

12/15/81

STS-5 (13000-6P)
PAYLOADS SBS
TELESAT-E
OSTA-2

LAUNCH DATE 11/11/82 ETR
CREW/DURATION 4M/ 5D
INCLINATION 28.5
ALTITUDE 160. N.M.
REF: JSC-09095-60

WTR SRB: NO
LIGHT WEIGHT SRB: NO
QMAX: 680.
SSME THROTTLE SETTING: 102/109
HPM: NO

	SHAPED AOA	SHAPED NOMINAL
CAPABILITY TO MECO	338067.	340209.
ET STS-5	-76603.	-76603.
OV102M INERT (3 EPS)	-155338.	-155338.
MANIFEST CHANGES	978.	978.
SSME X 3	-20709.	-20709.
NONPROPULSIVE CONSUM. (3.0 EPS)	-5902.	-5902.
STS WEIGHT CHARGED TO OPERATOR	-8693.	-8693.
PERSONNEL (4M/ 5D)	-3594.	-3594.
UNUSABLE FLUIDS (MPS)	-8798.	-8798.
MPS FPR (NOMINAL 3-SIG)	-5551.	-5551.
OMS PROPELLANT	-20405.	-20405.
RCS PROPELLANT (AFT)	-5424.	-5424.
RCS PROPELLANT (FWD)	-2464.	-2464.
DDT&E MANAGEMENT RESERVE	0.	0.
CAPABILITY	25564.	27706.
STS OPERATIONS RESERVE	-3000.	-3000.
P/L REQUIREMENT	-25526.	-25526.
PRINCIPAL PAYLOADS	24201.	24201.
DISCRETIONARY PAYLOADS	1325.	1325.
MARGIN	-2962.	-820.

NOMINAL ENTRY (MACH 3)
WT (LB) 204471.0
CG (IN)
X 1092.3 % 66.2
Y 0.1
Z 370.3

RTLS
WT (LB) 230484.0
CG (IN)
X 1088.4 % 65.9
Y 0.3
Z 371.3

AOA (MACH 3)
WT (LB) 223179.0
CG (IN)
X 1087.8 % 65.9
Y 0.0
Z 371.3

ENTER A C/R TO CONTINUE
>

FIGURE 3-9 LEVEL A PERFORMANCE ASSESSMENT

```
          SUMMARY FOR FLIGHT STS-5

LAUNCH DATE                          11/11/XX
REFERENCE                            JSC-09095-60
INCLINATION                          28.50
LIGHT WEIGHT SRB                      NO
MAX Q                                680.00
THROTTLE SETTING                     102/109%

TOTAL WEIGHT W/O PROP. CONSUM.       295387.
OMS PROPELLANT                        20405.
RCS PROPELLANT (AFT)                   5424.
RCS PROPELLANT (FWD)                   2464.


 ENTER A C/R TO CONTINUE
>
```

FIGURE 3-10 FLIGHT SUMMARY PAGE

The Flight Definition Block is checked to determine what predefined data exists and which calculations are required of the C.G. Processor. The results are tabulated as shown below.

```
AVAILABILITY OF PREDEFINED DATA
CURRENT FLIGHT AAAAAA
 7.  OMS PROPELLANT            YES/NO
 8.  PAYLOAD ATTACHMENT DATA   YES/NO
 9.  EI                        YES/NO
10.  RTLS                      YES/NO
11.  AOA                       YES/NO                    (3-40)
```

The value is 'YES' if the data is already defined, 'NO' if it is not already defined. The C.G. Processor will calculate all parameters marked 'NO'. Any of the 'NO' values may be changed to 'YES' in order to recalculate parameters or to perform parametric studies. Actual data base values will not be changed at this time, but the data base can be updated at the end of the processor, if desired.

Alternatively, parameters 7, 9, 10, and 11 can be changed from 'NO' to 'YES' by inputting data at this point. This is also useful for parametric studies, as the data base is not changed.

If it is desired to do a complete calculation, inputting a '12' will change all parameters to 'NO'.

Nominally, the X-coordinate of the vehicle center-of-gravity must be between 65 and 67.5 per cent. The user has the option of changing these limits in order to define his own C.G. envelope.

```
ENTER LIMITS OF X C.G. ENVELOPE (IN PER CENT)
C/R FOR STANDARD ENVELOPE -- 65.  TO 67.5
ENTER XMIN>                                            (3-41)
```

If the user wishes to use the standard envelope, he enters a C/R and SPICE will continue on that basis. Otherwise, he enters the minimum acceptable X-coordinate (in per cent). If it is desired to have the center-of-gravity at a particular value (e.g. 67.0%), enter that value.

ENTER XMAX (3-42)

Now the maximum value is entered. If it is desired to have the center-of-gravity at a particular location (which was entered previously), simply C/R at this time.

DO YOU WISH TO APPLY ENVELOPE TO ENTRY INTERFACE ONLY? (3-43)

It is usually required that the centers-of-gravity for entry interface, AOA, and RTLS fall within the envelope. However, if a particular value or a narrow envelope is sought, such a solution is usually not possible. By answering 'YES' to the above question, the user specifies that the envelope is to apply to entry interface only.

SPICE calculates a first guess on the amount of OMS propellant that will be required for the flight. It then prints

PAYLOADS TO BE PLACED IN BAY ARE:
1. PAYLOADNAME1
2. PAYLOADNAME2
3. PAYLOADNAME3
SELECT FRONT-TO-BACK SEQUENCE IN CARGO BAY (E.G. 1,3,2)
C/R FOR LISTED ORDER (3-44)

The user may input the sequence in which the payloads are to be placed in the cargo bay. If a new sequence is not input, payloads are placed in listed order--the first listed payload is the most forward.

SPICE now begins to attempt to place the payloads in the bay. The solution has six restraints:

1. Centers-of-gravity must be within the envelope.
2. Payloads must be separated by at least the amount of frontal clearance specified in the payload definition block, with an absolute minimum of six inches.
3. The aft end of the cargo bay is x=1302, unless an OMS kit is required. In this case x=1194 is the back of the cargo bay.
4. No payload can protrude forward of x=580.

5. Payloads must be placed where fittings exist.
6. Payloads must be in the indicated sequence.

NO SOLUTION CAN BE FOUND WITH THE PRESENT SEQUENCE.
DO YOU WISH TO INPUT A CLEARANCE RELAXATION FACTOR? (3-45)

This message is printed if no solution can be found to satisfy the constraints. A clearance relaxation factor can be input in order to reduce the required frontal payload clearance. For example, if .5 is input as the clearance relaxation factor, then all payload clearances are halved. However, the absolute minimum clearance of six inches still applies. If a relaxation factor is input, SPICE will again attempt to find a solution using the revised restraints.

DO YOU WISH TO SELECT ANOTHER SEQUENCE? (3-46)

If a clearance relaxation factor is not input, the user may specify a different payload sequence and attempt to find a solution based on the new sequence. If the user does not wish to enter a new sequence, then the flight cannot be processed further and the user may either specify a new flight or return to the SPICE Executive.

If a solution is found to satisfy the constraints, a display similar to figure 3-11 is produced. This will be the aft-most solution possible. The display consists of four parts.

1. A tabulation of payloads and clearances. The clearance listed for the first payload is the distance between the payload and the EVA envelope, at x=624. The clearances for the remainder of the payloads are actual frontal clearances.

2. A display of the Payload Attachment Block showing bridges, keels and longerons required for the flight.

3. The vehicle weight and center-of-gravity for nominal entry, AOA, and RTLS.

4. A menu of options for proceeding from this display.

```
A SOLUTION HAS BEEN FOUND.

 PAYLOAD NAME      CLEARANCE
  SBS                264.8
  TELESAT-E           68.3
  OSTA-2              36.1

            PAYLOAD ATTACHMENT DATA BLOCK FOR FLIGHT  STS-6

BRIDGE NUMBERS   1   2   3   4   5   6   7   8   9  10  11  12  13  14
 LEFT                                 X   X       X   X       X
 RIGHT                                X   X       X   X       X

KEEL   NUMBERS   1   2   3   4   5   6   7   8   9  10  11  12
                                     X           X           X

  NUMBER OF LONGERONS =  6

LONGERON ID          227       247       268       288       308
LONGERON WEIGHT     62.00     62.00     62.00     62.00     62.00
LONGERON X0        895.93    974.60   1057.20   1135.87   1214.53
LONGERON Y0          0.00      0.00      0.00      0.00      0.00
LONGERON Z0        404.00    404.00    404.00    404.00    404.00

LONGERON ID          315
LONGERON WEIGHT     62.00
LONGERON X0       1242.07
LONGERON Y0          0.00
LONGERON Z0        404.00


NOMINAL ENTRY (MACH 3)        RTLS                    AOA (MACH 3)
  WT (LB) 204471.0          WT (LB) 230484.0        WT (LB) 223179.0
  CG (IN)                   CG (IN)                 CG (IN)
      X  1092.3  % 66.2         X  1088.4  % 65.9        X  1087.8  % 65.9
      Y     0.1                 Y     0.3               Y     0.0
      Z   370.3                 Z   371.3               Z   371.3

  SELECT NEXT COURSE OF ACTION. ENTER
1 TO ACCEPT SOLUTION
2 TO REJECT AND CONTINUE
3 TO DISPLAY DEPLOYMENT CONTINGENCIES
4 TO SELECT NEW PAYLOAD SEQUENCE
5 TO ABORT
>
```

FIGURE 3-11 PAYLOAD PLACEMENT SOLUTION

The selection of option five, 'abort', will cancel execution for this flight. Either a new flight number is entered or SPICE returns to the executive.

Option four is for resequencing the payloads and again searching for the aft-most solution.

Option three displays deployment contingencies. See section 3.7.2 for an explanation of this option.

If option two is selected, SPICE will search for the next legal solution, forward of the previous solution. The user may continue this process until all legal solutions are exhausted.

If the displayed solution is acceptable, option one is selected. SPICE will proceed to calculate the OMS propellant load for the flight. The user will be requested to input a deployment sequence for the deployable payloads, which is to be used in calculating OMS for evasive maneuvers. Recircularizing of the Shuttle orbit will be assumed after each payload deployment except the final one. The user will have the option not to recircularize after the final deploy.

At the conclusion of the OMS calculation, the final OMS propellant requirement is printed, along with the vehicle weight and center-of-gravity and another list of options.

```
SELECT NEXT COURSE OF ACTION
0.  RETURN WITH NO UPDATE
1.  BALLAST CALCULATIONS
2.  MAX.  ALTITUDE CALCULATIONS
3.  BEAM MOUNTED GETAWAY SPECIALS
4.  RECYCLE THE PROCESSOR WITH THIS FLIGHT
5.  UPDATE THE DATA BASE WITH RESULTS OF THIS PROCESSOR          (3-47)
```

Options zero and five indicate that the processor execution is completed. With option five the data base is changed to reflect the results of the processor. Option zero simply ends the processor without altering the data base. The user may now either select another flight or return to the

SPICE Executive. Option four recycles the processor back to line 3-40. This is particularly useful for recalculating OMS propellant requirements after selecting Getaway Specials.

3.6.1 BALLAST CALCULATIONS

This option is used to calculate the amount of ballast required to bring the X and/or Y centers-of-gravity to within particular envelopes. Designated ballast locations are the nose wheel (x=292.), bridges 2, 12, and 13, and the aft body (x=1507.). Additionally, excess OMS fuel can be carried as ballast in the OMS tanks (x=1417.1). The bridge locations cannot be used if occupied by a payload.

The user is first asked

DO YOU WISH TO ADD BALLAST TO CORRECT YO? (3-48)

If the answer is no, the YO section is skipped, and the question is repeated for XO. After a yes answer.

ENTER LIMITS OF Y C. G. ENVELOPE
C/R FOR STANDARD ENVELOPE-- -1.5 TO 1.5 (3-49)

The procedure for inputting an envelope is the same as described above at line 3-41.

Once an envelope is established, SPICE computes the amount of ballast at each available location which would be needed to bring the envelope within the prescribed limits. The amount of ballast which can be used is fixed and dependent upon the location. If a location is available for use, but cannot hold sufficient ballast to completely correct the center-of-gravity, it is so marked. Figure 3-12 is an example of an available ballast display.

If the user intends to ballast for both X and Y, he should govern his Y ballast selection accordingly. For example, given a selection of bridge 2 or 13 for Y ballast, the user should select bridge 2 if his X C. G. is too far aft, and vice versa.

```
                    FLIGHT  STS-5
          % CG ENVELOPE =  65.9 TO  66.0

          UGT          X0          %          Y0          Z0
EI     204471.      1092.3       66.2        0.1       370.3
RTLS   230484.      1088.4       65.9        0.3       371.3
AOA    223179.      1087.8       65.9        0.0       371.3

                  AVAILABLE BALLAST

   LOCATION          REQUIRED MASS        X0              Y0      Z0
 9 CMS BALLAST             374.      1417.2 (91.4 %)    93.8   476.5
11 AFT BODY                294.      1507.0 (98.3 %)    51.0   310.0
SELECT LOCATION NUMBER.  (** SIGNIFIES INSUFFICIENT MASS TO CORRECT CG)
>
```

FIGURE 3-12 AVAILABLE BALLAST DISPLAY

The user selects one of the listed ballast locations. The process will be repeated until the center-of-gravity is brought within the envelope. When ballasting is complete, a display of the total ballast selected and resulting additional OMS load is presented (figure 3-13). This data is for information only and will not be included in any further calculations such as the flight performance calculations.

3.6.2 MAXIMUM ALTITUDE CALCULATIONS

This option calculates the maximum altitude a flight could obtain using full-up OMS and one, two, or three OMS kits. Figure 3-14 is an example of this option.

3.6.3 BEAM-MOUNTED GET-AWAY SPECIALS

This subprocessor allows the user to select beam-mounted Get-Away Specials for the flight. The totals for the weight and C. G. of the Get-Away Specials will be stored in the Flight Definition Block and included in further calculations for the flight. If Get-Away Specials were previously defined for the flight, the following menu will be presented:

```
GAS BEAMS PREVIOUSLY DEFINED FOR THIS FLIGHT.  ENTER
1.   TO DELETE EXISTING GET-AWAY SPECIALS
2.   TO ADD TO EXISTING GET-AWAY SPECIALS
3.   TO EXIT GAS ANALYSIS SUBPROCESSOR
```

If option two is selected, then all Get-Away Specials selected at this time will be added to the totals already stored in the Flight Definition Block. Option one will result in the newly selected Get-Away Specials replacing those previously selected.

Figure 3-15 is an example of the Get-Away Special display. It shows all of the bridges that are available for Get-Away Specials and what effect their selection would have on the X and Y coordinates of the nominal entry center-of-gravity. Bridges which currently contain payloads are marked by a double asterisk. The user enters number of cans, left or right side, and bridge number of each Get-Away Special location he desires.

FLIGHT STS-5
Y CG ENVELOPE = -1.5 TO 1.5
X CG ENVELOPE = 65.9 TO 66.0

	WGT	X0	%	Y0	Z0
EI	204845.	1092.9	66.3	0.1	370.5
RTLS	230858.	1088.9	65.9	0.3	371.6
AOA	223653.	1088.3	65.9	0.0	371.5

BALLAST REQUIREMENTS

	LOCATION	REQUIRED MASS	X0	Y0	Z0
8	OMS BALLAST (-Y)	187.	1417.2 (91.4 %)	-93.8	476.5
9	OMS BALLAST (+Y)	187.	1417.2 (91.4 %)	93.8	476.5
	TOTAL	374.	OMS DELTA DUE TO BALLAST =		30.

ENTER A C/R TO CONTINUE
>

FIGURE 3-13 BALLAST REQUIREMENTS DISPLAY

MAXIMUM ALTITUDES FOR FLIGHT STS-6

LOAD STATUS	MAXIMUM ALT.(NM)	DELTA-V ASCENT	DELTA-V ON-ORBIT	DELTA-V DESCENT	UNUSEABLE OMS	TOTAL OMS
FULL UP OMS	219.	636.7	100.0	368.8	1820.	25156.
+1 OMS KIT	304.	929.9	100.0	492.3	2721.	37594.
+2 OMS KITS	390.	1224.5	100.0	617.4	3355.	49766.
+3 OMS KITS	471.	1504.4	100.0	736.2	3990.	61938.

ENTER A C/R TO CONTINUE
>

FIGURE 3-14 MAXIMUM ALTITUDE DISPLAY

	WGT	X0	%	Y0	Z0
EI	204471.	1092.3	66.2	0.1	370.3
RTLS	230484.	1088.4	65.9	0.3	371.3
ACA	223179.	1087.8	65.9	0.0	371.3

BEAM MOUNTED GETAWAY SPECIALS

	LEFT SIDE 1 GAS		ORBITER C.G. EFFECT (EI)		2 GAS		ORBITER C.G. EFFECT (EI)	
BRIDGE	WT	X0	X(%)	Y	WT	X0	X(%)	Y
2	530.0	654.51	66.1	-0.1	880.0	664.34	66.1	-0.3
3	530.0	709.89	66.1	-0.1	880.0	719.93	66.1	-0.3
4	530.0	768.51	66.1	-0.1	880.0	778.34	66.1	-0.3
5	530.0	825.01	66.2	-0.1	880.0	834.84	66.1	-0.3
6**	530.0	881.01	66.2	-0.1	880.0	890.84	66.1	-0.3
7**	530.0	939.31	66.2	-0.1	880.0	949.14	66.2	-0.3
8**	530.0	999.81	66.2	-0.1	880.0	1009.64	66.2	-0.3
9**	530.0	1055.21	66.2	-0.1	880.0	1065.04	66.2	-0.3
10**	530.0	1105.51	66.2	-0.1	880.0	1115.34	66.2	-0.3
11**	530.0	1155.91	66.2	-0.1	880.0	1165.74	66.2	-0.3
12**	530.0	1210.01	66.2	-0.1	880.0	1219.84	66.3	-0.3

	RIGHT SIDE 1 GAS		ORBITER C.G. EFFECT (EI)		2 GAS		ORBITER C.G. EFFECT (EI)	
BRIDGE	WT	X0	X(%)	Y	WT	X0	X(%)	Y
2	530.0	654.51	66.1	0.3	880.0	664.34	66.1	0.4
3	530.0	709.89	66.1	0.3	880.0	719.93	66.1	0.4
4	530.0	768.51	66.1	0.3	880.0	778.34	66.1	0.4
5	530.0	825.01	66.2	0.3	880.0	834.84	66.1	0.4
6**	530.0	881.01	66.2	0.3	880.0	890.84	66.1	0.4
7**	530.0	939.31	66.2	0.3	880.0	949.14	66.2	0.4
8**	530.0	999.81	66.2	0.3	880.0	1009.64	66.2	0.4
9**	530.0	1055.21	66.2	0.3	880.0	1065.04	66.2	0.4
10**	530.0	1105.51	66.2	0.3	880.0	1115.34	66.2	0.4
11**	530.0	1155.91	66.2	0.3	880.0	1165.74	66.2	0.4
12**	530.0	1210.01	66.2	0.3	880.0	1219.84	66.3	0.4

SELECT GAS BY ENTERING -- NUMBER OF GASES,SIDE,BRIDGE NUMBER
FOR EXAMPLE - >2,L,10 PUTS 2 GASES ON THE LEFT SIDE OF BRIDGE 10.
BRIDGES MARKED ** CONTAIN PAYLOADS WITHIN THE BRIDGE ENVELOPE.
C/R IF FINISHED.
>

FIGURE 3-15 BEAM-MOUNTED GETAWAY SPECIAL DISPLAY

The total weight and center-of-gravity of the selected Get-Away Specials will be presented along with another menu

ENTER 1 TO SAVE THE SELECTED GASES.
ENTER 2 TO RESTART THE GAS ANALYSIS.
ENTER 3 TO EXIT WITH NO SAVE.

Thus, if the user wishes to use the selected gases in the flight analysis, he should select option one. To delete what he has alrady selected and to begin again, he should select option two. Option three is to terminate the subprocessor without saving any of the data.

3.7 REPORT GENERATOR

The Report Generator consists of various subprocessors, each designed to produce a particular report or display. Execution of the Report Generator begins with a menu of the available subprocessors.

SELECT REPORT OPTION
0. RETURN TO SPICE EXECUTIVE
1. VEHICLE BUILD-UP
2. C. G. CONTINGENCIES
3. PAYLOAD OF OPPORTUNITY
4. CARGO DATA SHEETS (3-51)

3.7.1 VEHICLE BUILD-UP

The vehicle build-up report is designed to illustrate the generation of an inert derived weight for a particular vehicle. Figure 3-16 is an example.

The only input necessary to execute this subprocessor is the execution mode and a vehicle identifier. Batch mode is available in order to produce hard-copy reports or to save the reports for later use. Reports are stored in temporary files named according to the vehicle identifier.

The vehicle identifier, E. G. OV-102, must correspond to a baseline definition previously input in the Data Base Management Processor. If not,

VEHICLE CONFIGURATION OV-102 PER JSC 09095-87 MASS PROPERTIES REPORT

	WGT	XG	YG	ZG
OV-102 INERT (DERIVED)				
OV-102 INERT (3 EPS)	153534.0	1062.8	-0.9	364.7
P/L ATTACH HRD	-676.0	1074.2	28.0	395.0
RMS	-941.0	926.1	-83.5	444.6
RMS INST & JET CNTL	-370.0	973.1	-89.5	410.0
P/L BAY LINER	-184.0	931.8	0.0	353.5
GALLEY	-164.0	469.0	-67.0	387.0
FLT DECK SEATS (MS,PS)	-110.0	560.0	0.0	425.0
EPS 3 PLUMBING	-271.0	919.3	-20.4	383.9
EPS 3/102 TANK	-604.0	1048.4	-14.8	299.4
RADAR(COMM A)	-320.0	578.2	77.9	456.4
FLT DECK SEATS(2)	-130.0	501.0	0.0	437.0
CONSEC	-41.0	550.0	-30.0	410.0
SUBTOTAL	149785.0	1066.4	-0.3	364.0

ENTER A C/R TO CONTINUE
>

VEHICLE BUILD-UP FOR OV-102

FIGURE 3-16

SPICE will print

***I CAN NOT FIND THE VEHICLE YOU REQUESTED.
DO YOU WISH TO CONTINUE WITH ANOTHER VEHICLE? (3-52)

If the vehicle baseline is found, figure 3-16 is displayed. Afterwards, another vehicle can be processed or the report generator menu is repeated.

3.7.2 C. G. CONTINGENCIES

This subprocessor analyzes a flight to determine the vehicle center-of-gravity for all combinations of payloads in and out of the cargo bay. The user inputs the flight number and the appropriate data is retrieved from the data base. The entry interface centers-of-gravity are calculated for each payload in-out combination and shown as in figure 3-17.

The first part of the display shows each payload with its up and down weight. The remainder of the display covers each payload combination. The up weight is used for payloads listed as 'IN', the down weight for those listed as 'OUT', thus the all 'OUT' condition corresponds to nominal entry interface, having all deployable payloads deployed.

If the center-of-gravity falls outside of the C. G. envelope for any combination, six asterisks are printed next to the percentage. If called in the Report Generator the envelope is always 65% to 67.5%. If called as the C. G. contingency option of the C. G. Processor, the envelope is as specified therein. If execution is taking place in the fast mode, only payload combination falling outside of the C. G. envelope will be displayed.

3.7.3 PAYLOAD OF OPPORTUNITY

This subprocessor displays a table of available space and performance margin for particular flights. This is used to determine locations for potential payloads of opportunity.

YOU MAY PROCESS AN ENTIRE MANIFEST OF SELECT INDIVIDUAL FLIGHTS.
ENTER 1 FOR ENTIRE MANIFEST, OR 2 TO SELECT FLIGHTS (3-53)

```
ENTER  6-CHARACTER FLIGHT NUMBER
>STS-5

   CARGO ELEMENT        UP WGT      DOWN WGT
   SBS                  9745.0       2394.0
   TELESAT-E            9759.0       2394.0
   OSTA-2               4697.0       4697.0

EACH CARGO DEPLOYMENT COMBINATION WILL BE CALCULATED AND PRINTED

 PAYLOAD 1 IN                      TOT WGT DOWN   210497.0
 PAYLOAD 2 OUT                              X0     1087.9
 PAYLOAD 3 OUT                              %        65.9
                                            Y0         0.4
                                            Z0       370.6

 PAYLOAD 1 OUT                     TOT WGT DOWN   210511.0
 PAYLOAD 2 IN                               X0     1093.6
 PAYLOAD 3 OUT                              %        66.3
                                            Y0         0.4
                                            Z0       370.6

 PAYLOAD 1 IN                      TOT WGT DOWN   217862.0
 PAYLOAD 2 IN                               X0     1088.2
 PAYLOAD 3 OUT                              %        65.9
                                            Y0         0.4
                                            Z0       371.0

 PAYLOAD 1 OUT                     TOT WGT DOWN   203146.0
 PAYLOAD 2 OUT                              X0     1093.5
 PAYLOAD 3 IN                               %        66.3
                                            Y0         0.4
                                            Z0       370.2

 PAYLOAD 1 IN                      TOT WGT DOWN   210497.0
 PAYLOAD 2 OUT                              X0     1087.9
 PAYLOAD 3 IN                               %        65.9
                                            Y0         0.4
                                            Z0       370.6

 PAYLOAD 1 OUT                     TOT WGT DOWN   210511.0
 PAYLOAD 2 IN                               X0     1093.6
 PAYLOAD 3 IN                               %        66.3
                                            Y0         0.4
                                            Z0       370.6

 PAYLOAD 1 IN                      TOT WGT DOWN   217862.0
 PAYLOAD 2 IN                               X0     1088.2
 PAYLOAD 3 IN                               %        65.9
                                            Y0         0.4
                                            Z0       371.0

 ENTER A C/R TO CONTINUE
>
```

FIGURE 3-17 C.G. CONTINGENCIES DISPLAY

If the user elects to select individual flights, he will be prompted to input the flight numbers individually. Otherwise, he is asked for the manifest designation.

ENTER MANIFEST DESIGNATION. (E.G. STS-) (3-54)

Thus, if the flights are numbered in a manner such as STS-5, STS-6, STS-7, etc., the user may input STS- and all of the appropriate flights will be processed.

Figure 3-18 is an example of the payload of opportunity report. The second column is the distance from the front of the first payload to the EVA envelope at x=624. If the value is negative, the payload extends into the EVA envelope. Column three is the performance margin, and column four is a list of the bridges not occupied by a payload.

3.7.4 CARGO DATA SHEET

The cargo data sheet is a display of pertinent information for a cargo element, combining data from the Payload Data Block and the Carrier Data Block. The user inputs a payload name and the required payload and cargo data is retrieved and displayed. Figure 3-19 is a sample cargo data sheet.

3.8 GRAPHICS PROCESSOR

The Graphics Processor produces C. G. envelope curves. These curves have the abscissa axis as either x or y location in the Orbiter, and the ordinate axis as cargo weight. The area under the curve defines the allowable center-of-gravity for a cargo of a specific weight. If the cargo center-of-gravity is within this allowable range, then the overall vehicle center-of-gravity will satisfy its constraints.

Figure 3-21 and 3-20 are examples of a planning envelope curve and a cargo envelope curve, respectively. The difference between the two curves is principally in the reference weight. The planning envelope curve is geared to a specific vehicle configuration, without any cargo. The reference weight consists of the vehicle weight without cargo, less the deltas for consumables. The cargo envelope curve is geared to a vehicle with a specific cargo and the reference weight is increased by the weight of the attachment hardware, less the payload chargeable items.

PAYLOAD OF OPPORTUNITY REPORT
13000-6P

FLIGHT NUMBER	AVAILABLE LENGTH X-624. TO P/L 1	PERFORMANCE MARGIN	LEFTOVER BRIDGES (2-8)
STS-4	426.05	2158.	2,3,4,5,6,7,8,
STS-5	264.78	-2962.	2,3,4,5,
STS-14	97.22	1143.	2,
STS-28	0.00	846.	
STS-38	120.77	3600.	2,
STS-40	19.00	-298.	
STS-41	63.00	-4114.	
STS-46	179.93	4732.	2,3,
STS-47	0.00	673.	

ENTER A C/R TO CONTINUE
>

FIGURE 3-18 PAYLOAD OF OPPORTUNITY REPORT

C A R G O D A T A S H E E T

		TDRS	IUS-2T	ASE	WT ALLOWANCE	COMPOSITE
WEIGHT UP		5000.00	32500.00	7500.00	212.00	45212.00
WEIGHT DOWN		0.00	0.00	7500.00	212.00	7712.00
LENGTH UP		230.25	201.00	171.20	0.00	431.25
LENGTH DOWN		0.00	201.00	171.20	0.00	201.00
DIAMETER		108.00	116.00	180.00	0.00	180.00
C.G. UP	X=	965.40	1133.13	1123.03	1122.20	1112.85
	Y=	0.60	0.14	-1.65	-2.00	-0.12
	Z=	399.40	400.00	397.10	396.60	399.44
C.G. DN	X=	0.00	1133.13	1123.03	1122.20	1123.01
	Y=	0.00	0.14	-1.65	-2.00	-1.66
	Z=	0.00	400.00	397.10	396.60	397.09

	DEPLOYMENT	TRANSFER	FINAL
HEIGHT AT APOGEE	150.00	19324.00	19324.00
HEIGHT AT PERIGEE	150.00	150.00	19324.00
INCLINATION ANGLE	28.50	27.00	0.00

DELTA V FOR EVASIVE MANEUVERS	70.00
DELTA V FOR RETURN TO ORBIT	70.00
DISTANCE FROM KEEL TO FRONT TRUNNION	0.00
DISTANCE FROM KEEL TO AFT EDGE	180.80
PAYLOAD POSITION FLAG	-1
PRIMARY LONGERON INDICATOR	2
NUMBER OF LONGERON FITTINGS	3
DEPLOYABLE FITTINGS FLAG	0

DISTANCES BETWEEN LONGERON FITTINGS

94.40 70.80

PAYLOAD ATTACHMENT DATA BLOCK FOR PAYLOAD TDRS

BRIDGE NUMBERS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
LEFT									X		X	X		
RIGHT									X		X	X		

KEEL NUMBERS	1	2	3	4	5	6	7	8	9	10	11	12
									X			

NUMBER OF LONGERONS = 3

LONGERON ID	269	293	311
LONGERON WEIGHT	62.00	62.00	62.00
LONGERON X0	1061.13	1155.53	1226.33
LONGERON Y0	0.00	0.00	0.00
LONGERON Z0	404.00	404.00	404.00

ENTER A C/R TO CONTINUE
>

FIGURE 3-19 CARGO DATA SHEET FOR TDRS PAYLOAD

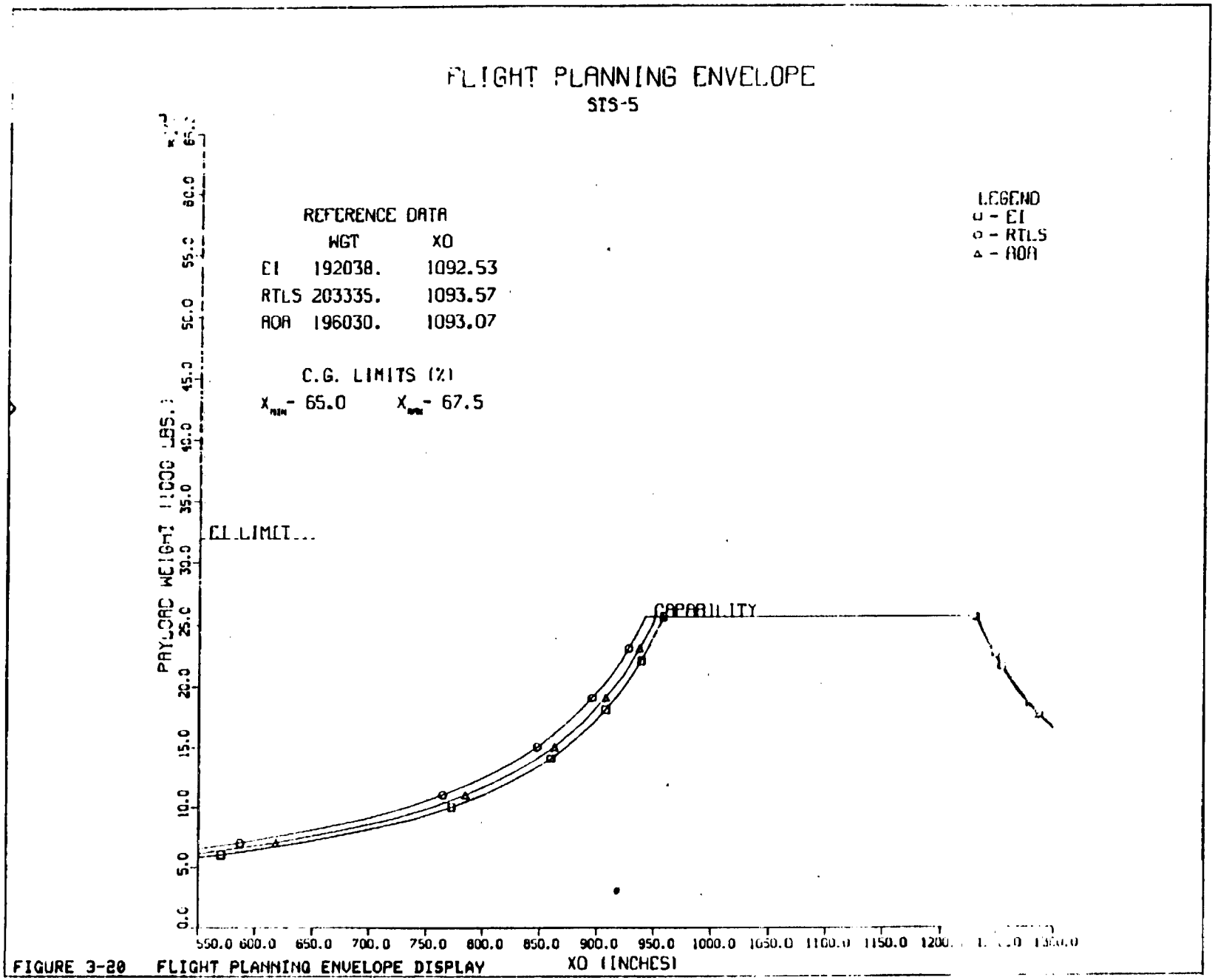

FIGURE 3-20 FLIGHT PLANNING ENVELOPE DISPLAY

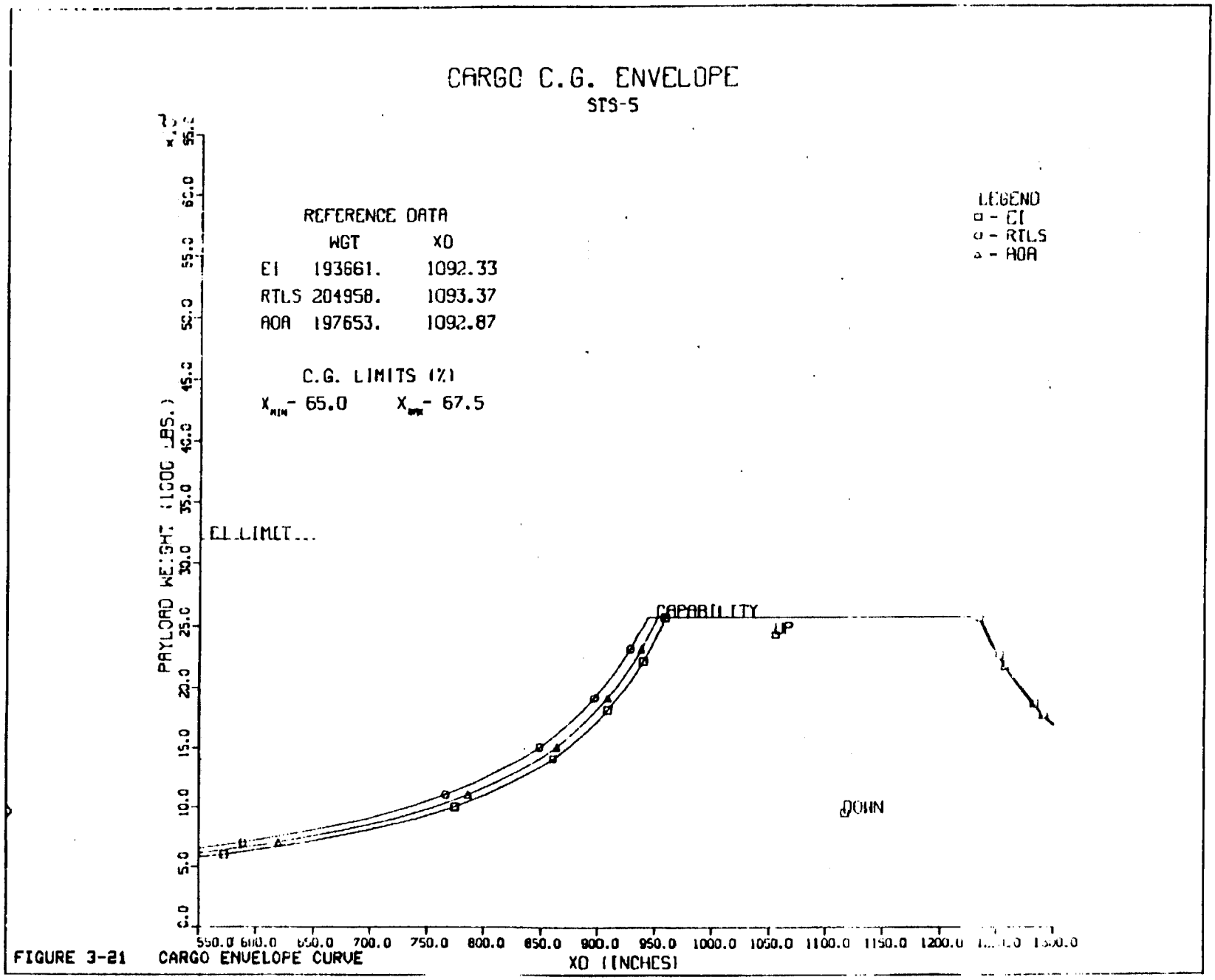

FIGURE 3-21 CARGO ENVELOPE CURVE

In selecting execution mode, the normal mode will result in plots with grid lines. The fast mode will eliminate grid lines from the plots. This will accelerate plotting by a factor of five. The user selects the execution mode, inputs a flight number, and selects a curve type:

ENTER 1 FOR PLANNING ENVELOPE CURVE
ENTER 2 FOR CARGO ENVELOPE CURVE (3-55)

The flight has normally been processed through the C. G. Processor and the Cargo Planning Data Processor prior to execution of the Graphics Processor. This is in order to generate vehicle, cargo, chargeables, and payload attachment hardware weights. SPICE will retrieve this data from the data base. If not found, it prints

SOME REQUIRED DATA FOR THIS FLIGHT IS MISSING.
SHOULD I CONTINUE? (3-56)

If the user answers no, he may select another flight or return to the SPICE Executive. If he answers yes, SPICE will continue, using whatever data is available in the data base.

The user must define a C. G. envelope for the x coordinates. This procedure is described under line 3-41 of the C. G. Processor. The user is then asked

DO YOU WISH TO SEE THE Y PLOT? (3-57)

If the y C. G. envelope curve is desired, a C. G. envelope for y is defined. The procedure is similar to that for x, except that absolute coordinates are used rather than percentages. Default is y=-1.5 to y=1.5.

SPICE will not proceed to draw the plots. When each plot is complete, the terminal bell will sound and the plot will be displayed until the user enters a C/R.

APPENDIX A - ACRONYMS AND ABBREVIATIONS

AOA	ABORT-ONCE-AROUND
CG	CENTER-OF-GRAVITY
C/R	CARRIAGE RETURN
EI	ENTRY INTERFACE
EPS	ELECTRICAL POWER SYSTEM
ET	EXTERNAL TANK
ETR	EASTERN TEST RANGE
FPR	FLIGHT PERFORMANCE RESERVE
GAS	GETAWAY SPECIAL
HPM	HIGH-PERFORMANCE MOTOR
JSC	JOHNSON SPACE CENTER
MECO	MAIN ENGINE CUTOFF
MSFC	MARSHALL SPACE FLIGHT CENTER
MPS	MAIN PROPULSION SYSTEM
NPC	NONPROPULSIVE CONSUMABLES
OMS	ORBITAL MANEUVERING SYSTEM
RCS	REACTION CONTROL SUBSYSTEM
RTLS	RETURN TO LAUNCHSITE
SAMPLE	SCHEDULING ALGORITHM FOR MISSION PLANNING AND LOGISTICS EVALUATION
SPICE	SHUTTLE PAYLOAD INTEGRATION AND CARGO EVALUATION
SRB	SOLID ROCKET BOOSTER
STS	SPACE TRANSPORTATION SYSTEM
WTR	WESTERN TEST RANGE

ERROR AND WARNING MESSAGES

The following error and/or warning messages are included in SPICE. The text of the message, the subroutine where it occurs, and the circumstances regarding its occurrence are presented here.

	MESSAGE	SUBROUTINE	CIRCUMSTANCES
1.	***WARNING*** THIS DATA BASE ALREADY CONTAINS 10 BASELINES. THIS IS THE MAXIMUM ALLOWED.	ADDBAS	An attempt was made to add a baseline to the data base when the data base already contained its maximum of ten baselines. One or more baselines must be deleted before any can be added.
2.	***ERROR IN ADDBAS. BASELINE ID NOT ON FILE AND CAN NOT BE ADDED UNLESS NBLK IS ZERO.	ADDBAS	This error should not occur in normal operation It can only occur as a result of a program logic error.
3.	***ERROR IN SUBROUTINE ADDCID. CARRIER SEQUENCE NUMBER TOO LARGE.	ADDCID	Program logic error. Carrier index is out of sequence.
4.	***ERROR IN SUBROUTINE ADDFLT. FLIGHT SEQUENCE NUMBER TOO LARGE.	ADDFLT	Program logic error. Flight index is out of sequence.
5.	***ERROR IN SUBROUTINE ADDITM. DATA BASE FULL. NO MORE DATA ITEMS CAN BE ADDED.	ADDITM	The data dictionary contains its limit of 980 items. None can be added until there are one or more delected.

6. ***ERROR IN SUBROUTINE ADDPID. PAYLOAD SEQUENCE NUMBER TOO LARGE.	ADDPID	Program logic error. Payload index is out of sequence.
7. YO (OR XO) IS WITHIN THE ENVELOPE.	BALAST	The user defined a c.g. envelope for ballasting, but the flight is already within the envelope.
8. ***NO DATA FOR THIS CATEGORY.	BLDUPL, CATLIS, CATWGT	A baseline definition category is not defined correctly.
9. REQUESTED CARRIER NOT FOUND.	CARDAT	The user specified a carrier identifier which is not contained in the data base.
10. ***ERROR***BASELINE ID OF CURRENT AND PREVIOUS FLIGHT DISAGREE. FLIGHT AAAAAA BASELINE = AAAAAA PREV FLT = AAAAAA BASE-LINE AAAAAA.	CARGO	The Flight Definition Block of the current flig contains a previous flight number. However, the two flights specify different baselines, and are thus incompatible.
11. ***ERROR*** VEHICLE TYPE OF CURRENT AND PREVIOUS FLIGHT DISAGREE. FLIGHT AAAAAA VEHICLE = AAAAAA PREV FLT AAAAAA VEHICLE AAAAAA.	CARGO	The Flight Definition Blocks of the current and previous flights specify different vehicles and are thus incompatible.
12. INSUFFICIENT PREDEFINED DATA TO EXECUTE THIS FLIGHT. REQUIRED DATA CAN BE CAL-CULATED IN THE C.G. PROCESSOR.	CARGO	User attempted to execute Cargo Planning Data Pro-cessor without first running the C. G. Proces

13. THE FLIGHT YOU REQUESTED IS NOT ON THE DATA BASE.	MANY	User requested a flight number which is not on the data base. Option memu follows.
14. BASELINE ID NOT FOUND. THE SELECTED FLIGHT CAN NOT BE PROCESSED.	CARGO, CGPROC	Flight Definition Block specifies a baseline identifier which is not on the data base. The user must return to the Data Base Management Processor to define the baseline or change the baseline identifier called for in the Flight Definition Block.
15. PREVIOUS FLIGHT NUMBER NOT FOUND.	CARGO	Current flight's Flight Definition Block calls for a previous flight number which is not on the data base. Option menu follows.
16. SOME REQUIRED DATA FOR THIS FLIGHT IS MISSING. SHOULD I CONTINUE?	CGENVL	User is attempting to plot the C. G. envelope for a flight which has not been run through the C. G. and Cargo Planning Data processors.
17. **FATAL ERROR - CLRSCN **INTERNAL BUFFER OVERFLOW	CLRSCN	Program logic error. ASCII buffer in screen erase routine is in overflow condition.

18.	NO DATA EXISTS FOR THE FOLLOWING CONDITIONS. CREW = NN, DAYS = NN	CREMAT	A combination of crew size and mission length was input which is not covered by the crew equipment matrix. One of those factors must be redefined or the matrix must be expanded.
19.	STS DATA BASE ERROR (DAREAD) DEVICE ERROR AND NO DATA CAN BE READ FROM filename	DAREAD, ISRD	An attempt to read data from an NTRAN file failed due to a device error.
20.	*****WARNING*****THIS ITEM NOT IN DATA DICTIONARY item name.	ERRDAT	A request was made to retreive the listed data item name from the Data Dictionary, where it was not found. Either an input error has been made or the item should be added to the Data Dictionary. Check spelli
21.	STS DATA BASE ERROR (DAWRIT) DEVICE ERROR WHILE WRITING ON FILE NAME.	DAWRIT, ISOUT	An attempt to write data onto an NTRAN file failed due to a device error.
22.	***WARNING*** QMAX IS GREATER THAN MAX. ALLOWABLE QMAX.	DOLADJ, MECO	The flight definition calls for a maximum dynamic pressure greater than the maximum allowed for the month, launch site, SRB combination. Program will continue, but will use the maximum allowable.
23.	REQUESTED BASELINE ID NOT NOT FOUND.	EDBASE, ITUSED	The user attempted to display/ edit a baseline which does not exist.

24.	STS WARNING (ENLARG) FILENAME HAS BEEN ENLARGED FROM NNN TRKS TO NNN TRKS.	ENLARG	An attempt was made to write beyond the boundary of an NTRAN file. The file has been enlarged to accommodate the request.
25.	ERTRAN ERROR NO. NNN.	ENLARG	An attempt to enlarge an NTRAN file failed with an "executive request" error. Writing beyond the file boundary will not be allowed.
26.	***ERROR IN SEQUENCE SELECTION	FROBEL	User was requested to enter a sequence of integers, separated by commas. All of the request integers were not included.
27.	*****FRONT OF CARGO BAY REACHED. NO SOLUTION CAN BE FOUND WITH THE PRESENT SEQUENCE.	FROBEL	Program was unable to fit the prescribed cargo into the cargo bay. User must relax clearances, change the payload sequence, or redefine the flight.
28.	YOUR SELECTION -- AAAAAA -- IS ILLEGAL	GASANA	User made an input error while selecting a beam-mounted Get-away Special Read the instructions and example carefully, and try again.
29.	REQUESTED BASELINE NOT FOUND. DO YOU WISH TO INPUT A NEW BASELINE ID?	INPFLT	While defining a new flight, the user input a non-existent baseline identifier. In order to continue with the flight, the user must input the identifier for an existing baseline.

30.	LONGERON ID NOT FOUND. DO YOU WISH TO INPUT NON-STANDARD FITTING?	INPPAB	A set of standard longeron fittings is stored in the program (Figure 2-5). The user input an identifier not found in the table. This is allowable, but he must input weight and c.g. for the fitting.
31.	REQUIRED PAYLOAD NOT FOUND. (Payload name)	LODCOM	A payload was identified as being on a flight, but the payload is not on the data base.
32.	IS A PORT-SIDE ONLY FITTING ACCEPTABLE FOR (payload name)	LONGER	A possible solution to loading the cargo bay has been found, but it involves a port-side-only fitting location. If this is not acceptable, the program will continue searching for another solution.
33.	*****WARNING--ITERATION DID NOT CONVERGE	MAXALT	The OMS iteration process in calculating maximum flight altitude did not coverge after one hundred times. Program will continue as if it had converged.
34.	STS DATA BASE ERROR. UNABLE TO DETERMINE FILE SIZE.	OPENDB	There is an error in the EXEC 8 file specification. Program will terminate. If problem is of a temporary nature, it will usally disappear if the user signs off the syst and logs on again.

35.	REQUESTED PAYLOAD NOT FOUND. (PAYDAT)	PAYDAT	User attempted to display/ modify a payload which does not exist. Check spelling!
36.	PAYLOAD = (payload name) NOT FOUND. ENTER NEW ID OR C/R TO END FLIGHT PROCESSING.	PLLIST, PLWCGS, PLWGTS	Flight Definition Block calls for a payload which does not exist. User must enter identifier of an existing payload or return to Data Base Management and define the missing payload.
37.	CARRIER = (carrier identifier) NOT FOUND. ENTER NEW ID OR C/R TO END FLIGHT PROCESSING.	PLLIST,	Payload Data Block calls for a carrier which does not exist. User must enter identifier of an existing carrier or return to Data Base Management and define the missing carrier.
38.	(flight number) INSUFFICIENT DATA	PLOPP	This message is printed in the Payload of Opportunity report when the requested flight has not been executed in the C.G. and Cargo Planning Data processors.
39.	***ERROR-- PAYLOAD CROSSES AFT BULKHEAD.	PRESET	A cargo element with a predefined location in the cargo bay has been misdefined. A solution will not be possible until the cargo element is defined correctly.
40.	***ERROR IN RETBAS. NBLK IS GREATER THAN NUMBER OF WORDS IN B.D.B.	RETBAS	Program logic error. An attempt has been made to retrieve more words from a Baseline Definition Block than it contains.

41.	filename IS NOT AVAILABLE AT THIS TIME.	SPICE	An unacceptable data base name was input. The file is in use by another user; does not exist; or has been disabled. Program will terminate.
42.	ATTENTION! IT IS TIME TO TAKE OUT THE GARBAGE.	SPICE	The data base needs to be compressed.
43.	***WARNING*** INCOMPATIBLE PARKING ORBITS	TESTFL	A payload on the flight calls for a parking orbit which is different than the flight altitude.
44.	TOTAL LENGTH LIMIT EXCEEDED FOR THIS FLIGHT.	TESTFL	The total length of the cargo elements on the flight exceeds the cargo bay length.
45.	TOTAL WEIGHT LIMIT EXCEEDED. WE CAN'T LIFT THIS ONE!	TESTFL	The total weight of the cargo elements on the flight exceeds sixty-five thousand pounds.
46.	***I CAN NOT FIND THE VEHICLE YOU REQUESTED.	VBLDUP	In the Vehicle Buildup sub-processor, the user input a vehicle identifier which does not correspond to a baseline identifier.
47.	FILE IS WRITE-PROTECTED. UP-DATE REQUEST REJECTED.	WRCHEK	An attempt was made to update a write-protected data base. The update request is ignored.
48.	ILLEGAL REPLY	YESNO	A question was answered with a response other than Y or N.